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A Swedish dentist looks over casts of orthodontic cases in the Eastman Dental Clinic, Stockholm.

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James L. Wesner, at present a Captain in the Army Dental Corps, received his D.D.S. from Indiana University, School of Dentistry, in 1944. His Clinical and Laboratory Suggestion, Adapting Wax for a Three-Quarter Crown Preparation, appeared in the Digest in May 1945. This month he presents A Guide to the Use of Acrylics for the General Practitioner.

Mischa Kroop, D.D.S. (Columbia University, School of Dental and Oral Surgery, 1924) engages in the practice of general dentistry. A number of his writings have appeared in the dental literature. In A Method for Combining Gold and Acrylic in Fixed Bridge Pontics this month, he outlines a technique he has evolved to meet one dental problem.

Sidney A. Forman, D.D.S. (Western Reserve University, School of Dentistry, 1938) discussed Self-Administered Ethyl Chloride Analgesia in the Digest in November 1942. Himself a general practitioner, he has written for this issue on The Use of Ethyl Chloride by the General Practitioner in anesthesia.

Ray Swartz, D.D.S. (University of Southern California, College of Dentistry) practices general dentistry. The diatomaceous earth technique which he details in this issue is the result of research that he has done on the uses of diatomite in gold inlay fabrication.

Solomon L. Quitt, D.D.S. (University of Maryland, College of Dentistry, 1914), a general practitioner, reported cases for us in December 1945 and June 1946. The current case report concerns Restoration of Lost Vertical Dimension, Resulting In Improved Hearing and Relief of a Disorder of the Temporomandibular Articulation.

Acrylics for Jacket Crowns and Bridge Prosthesis: A Guide to the Use of Acrylics for the General Practitioner

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The dentist whose laboratory facilities and time permit him to invest and cast his own inlays will find these methods practical, also, for processing his own jacket crowns and acrylic bridges. Emphasis is placed on methods which are both simple and reliable.

ACRYLICS and silicate cement have much in common. Both have a definite place in dentistry; properly used, both materials will produce certain esthetic effects. Silicate cement was introduced to meet these esthetic needs and was simplified as much as possible by the manufacturers. Many practitioners, however, further attempted to simplify its use, innovating a few of their own procedures, with the result that restorations did not hold up to their expectations. They then regarded the material unfavorably.

Acrylics have likewise been simplified to the utmost by the manufacturer. But there are certain rules or procedures that must be followed in their use; then the finished restoration will present a most pleasing appearance and have satisfying durability (Figs. 1 and 2).

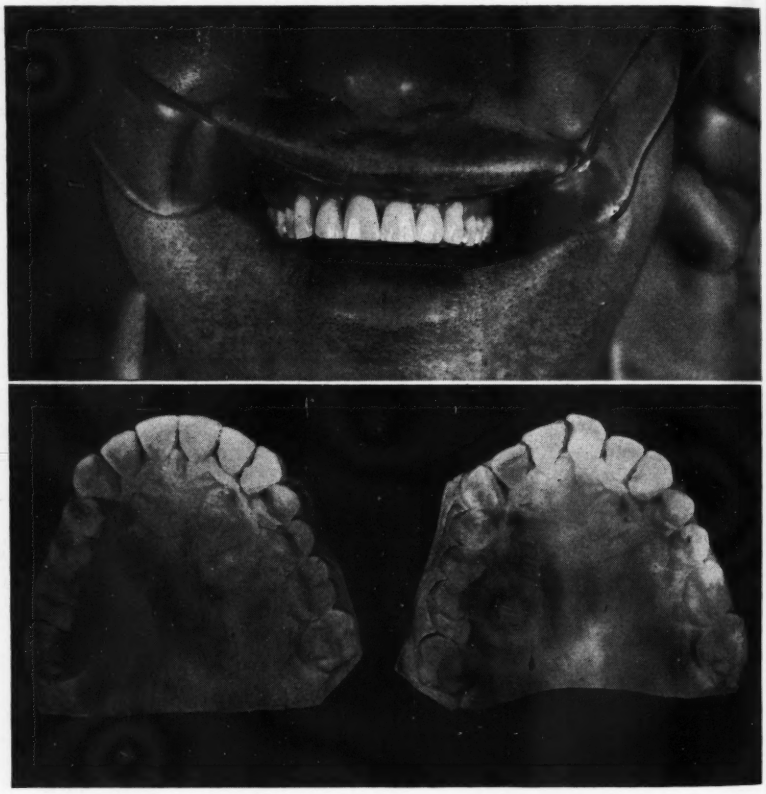


Fig. 1 (top)—Four anterior acrylic jackets.
Fig. 2—Model (left) of acrylic jackets shown in Figure 1 and model of same patient before restorations (right).

Advantages of Acrylics

Acrylic has certain advantages over fused porcelain which it might be well to list:

1. It is more economical to use, as less special equipment is needed. The methods of processing also result in a marked saving of time.

2. The finished product is less friable; lingual fractures in jacket crowns and "cracked" bridges are almost unheard of.

3. It possesses greater translucency, or "natural tone."

4. The patient will notice a very natural "feel" when biting, due to the resiliency of the material, in contrast to the hard, glass-like feel of fused porcelain.

5. A closer fit with better tissue adaptation is possible. The use of wax pattern permits direct techniques, and pontics may be waxed directly against the tissues.

6. The material has a high tissue tolerance even having been used internally for surgical splints and skull plates.

7. There is less shrinkage in processing; the original carving in the wax pattern will be reproduced accurately.

Cementation and Resistance to Abrasion

Questions have been raised regarding cementation and resistance to abrasion.

1. The answer to cementation seems to lie in the greater frictional resistance embodied in the preparation itself. This will oppose any tendency of a restoration to spring or "pop" off, due to resiliency of the material itself. A mechanical lock may also be employed by cutting opposing

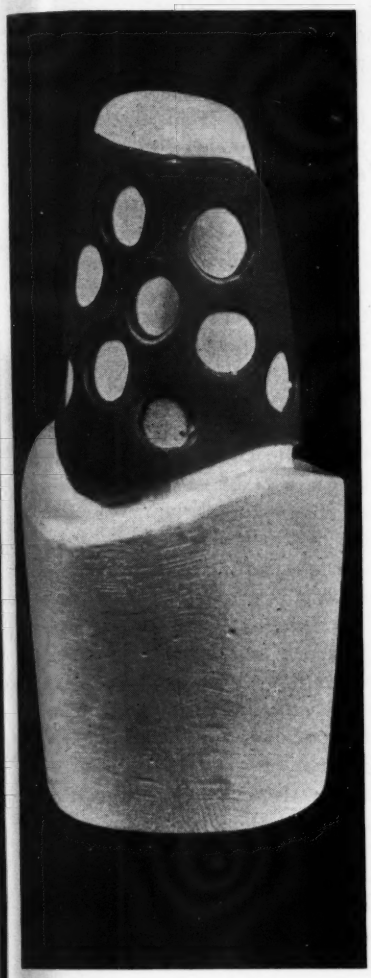


Fig. 3—Proximolingual view of modified gold thimble showing perforations on lingual.

grooves in the preparation and restoration immediately prior to cementation. In most cases, however, this is not necessary.

2. Experience has shown in regard to abrasion that under the full force of occlusion acrylic teeth do not hold up well in full denture prosthesis. In the construction of posterior bridges, however, if only one or two teeth are to be replaced, the practitioner need not worry, as the other natural teeth will carry the load. If the bridge is to be one of a long span, on the other hand, it is advisable to construct cast gold occlusal surfaces which in turn may serve as part of the framework necessary in acrylic bridges.

Construction of An All-Acrylic Bridge

Since the main purpose of this article is to familiarize the practitioner with the technique used for acrylic restorations, the following procedure is given for the construction of an all-acrylic bridge using jacket crowns as abutments:

1. Preparation. The preparation should contain great frictional resistance; this is an aid to cementing. Proximal walls should be nearly parallel in contrast to the tapered walls for porcelain preparation. There is little or no danger of splitting the finished crown due to the resiliency of the material. Margins are never beveled. A knife-edge will not hold up in the finished acrylic. Allow for a great bulk of material. This means a wide, flat shoulder on jacket crown preparations and complete removal of

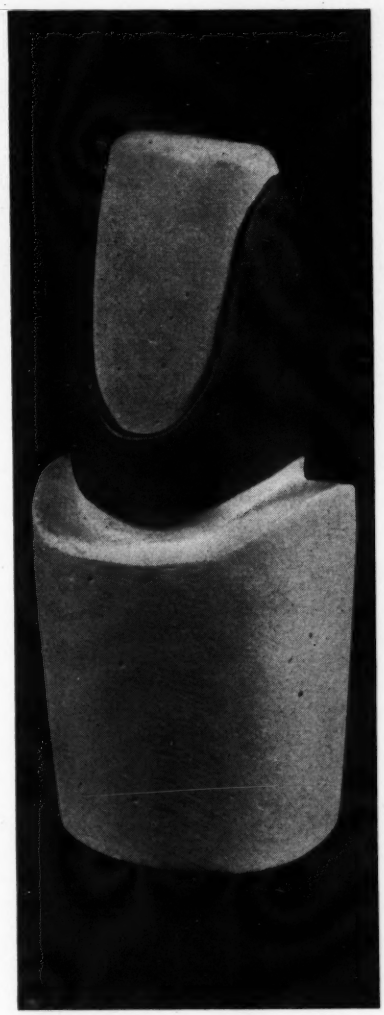


Fig. 4—Proximolabial view of modified gold thimble showing labial cut away to avoid gold shadows.

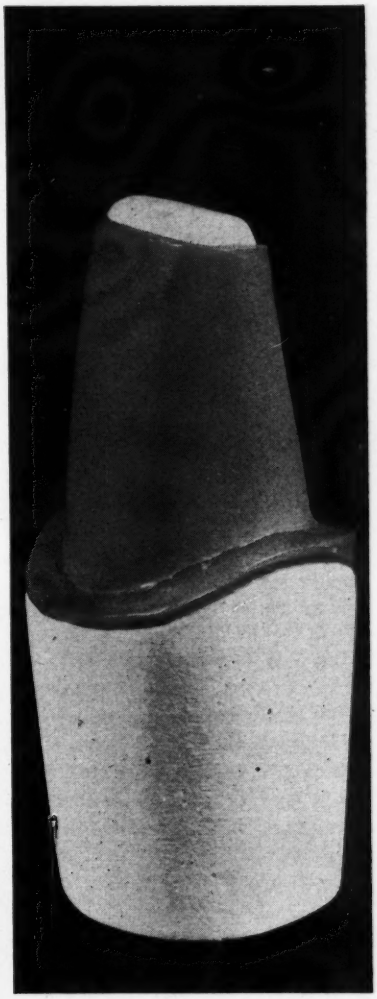


Fig. 5—Proximolabial view of full gold thimble, including shoulder.

enamel from labial surfaces to prevent cement shadows. As a general rule, the shoulder should be the full width of a #557 or #558 fissure bur for lateral incisors and a #559 or #560 fissure bur for centrals and cuspids.

2. Impression. The copper band and compound impression of the preparation should be taken first. The importance of accuracy at this point cannot be overstressed, for the finished crown is processed on the stone die made from this impression which is then boxed with sheet wax and poured in artificial stone. A small lump of softened, pink wax is now pressed over the prepared tooth and a plaster impression taken of the wax-covered preparation, adjacent teeth, and surrounding tissues. When the

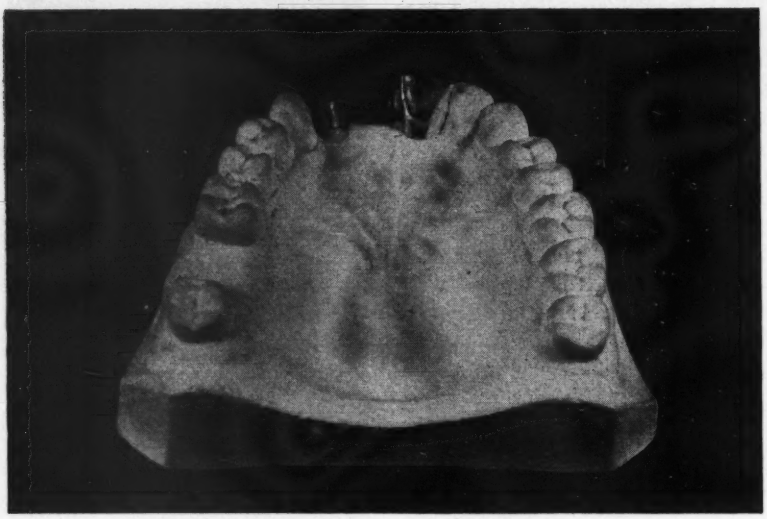


Fig. 6—Cast framework, flat bar type, with perforations.

impression is removed from the mouth, it should contain the wax which was previously pressed over the preparation. The stone die, when it has hardened sufficiently, is removed from the copper band, trimmed to a taper, and lubricated. It is then placed in position in the wax and plaster impression and a cast poured in stone.

3. Construction of the gold framework. Gold thimbles must be made to fit over the preparations. For a short span bridge the modified thimble may be used (Figs. 3 and 4). If the bridge is to replace three or more teeth, however, a full thimble with a gold shoulder should be constructed (Fig. 5). These are now joined by the interabutment mesh, the construction of which is very important to the future of the bridge. A simple rod or half round wire will not do. Stress on a bridge so constructed will result in fracture of the acrylic at the interproximal grooves and rotation of the pontic on the rod. It is necessary, therefore, to use one of these three suggested types:

a) A connecting frame of two or three cast rods or half round wires.

b) A cast, flat, girder perforated for a firmer grip by the acrylic (Fig. 6).

c) In short bite cases where the bridge will be subjected to great stress, a cast gold lingual can be made in which gold loops are incorporated for attachment to the acrylic (Fig. 7).

Fig. 7—Cast gold lingual soldered to ¾ crowns showing gold loops for attachment of acrylic.

In construction of a framework it is necessary to avoid "fracture lines." Any sharply defined line in plastic is a point of possible fracture. The "Y" bar is therefore unsatisfactory, in that it creates three possible fracture lines. It is advisable, if convenient, to return the completed framework to the mouth at this point to ensure proper fit. The framework is then placed back in position on the cast and a rough wax-up done. The finished waxing and contouring is completed in the mouth. This eliminates any errors due to a faulty cast. Gross anatomy is observed but the more delicate touches, such as labial grooves, etc., are left undone until the bridge is finished in acrylic.

4. Flasking and processing the bridge. The first step is to place the stone die into the jacket crown, sealing it around the shoulder with a fine bead of wax (Fig. 8). (Although the illustrations show only a single jacket crown, the technique is the same for an entire bridge.)

The bridge is then invested in stone, labial side upward in the lower half of the flask (Fig. 9). As soon as the stone is hardened, the surface is lubricated with vaseline and the top half of the flask is placed in position and filled with stone.

5. The flasks are opened and a varying portion of the incisal removed from the wax pattern. The portion to be removed will determine the area later occupied by the incisal shade. A second top half section of a flask is placed in position and filled with stone (Fig. 10).

6. The flasks are again separated and all traces of wax removed with boiling water (Fig. 12). While the flasks are still hot, the stone surface is painted with the Plas-cote or "liquid foil"; this is allowed to soak in for about 30 seconds after which the remainder is blown out with air.

7. Mixing and packing the acrylic. The proper body shade is selected and the amount of powder necessary is put into the mixing jar. If a blend of powders is used, the jar should be closed and tumbled thoroughly before adding the liquid; this will ensure an

even mixing of pigment and eliminate transparent areas or whorls. With a dropper, liquid is slowly added around the edges of the powder until it becomes saturated. The mixing jar is then tightly closed and allowed to stand five or ten minutes, or until the mix becomes "doughy." When the acrylic is at proper packing consistency, there will be no tendency of the material to "string out" if an instrument is stuck into it and then withdrawn. The acrylic is then pressed into the mold, being worked beneath the framework as thoroughly as possible with a clean instrument. An excess amount is next added and a sheet of moistened cellophane placed over the top of the acrylic mass. The second top half of the flask is now placed in position and pressure applied slowly with a bench press. After the excess has been allowed to squeeze out, the flask should be opened, the excess removed, the flask closed again with a fresh piece of cellophane and placed under pressure (Fig. 12).

8. The flask and press are now immersed in boiling water for approximately ten minutes to toughen the material so that it will not be displaced when the incisal shade is added. The flask is allowed to cool; the incisal shade, mixed as before, is packed, and the flask again closed, the *first* top half of the flask being used (Fig. 13). The flask, in the press, is now placed in water for processing. The water is brought to the boiling point over a period of 30 minutes and allowed to boil 1½ - 3 hours. The flask and press are then removed and allowed to bench cool to room temperature before being opened. After removing all traces of the stone, the final shaping and polishing of the acrylic bridge is begun.

An alternate method for packing the incisal shade eliminates the double flask method detailed above. Only one top half of the flask is poured in stone. This is used to pack the body shade to full contour. With a sharp knife or razor blade the incisal portion of the acrylic is removed and with a clean instrument the dry incisal acrylic powder is scattered about over this area. Acrylic liquid is touched to the edge of the powder with a

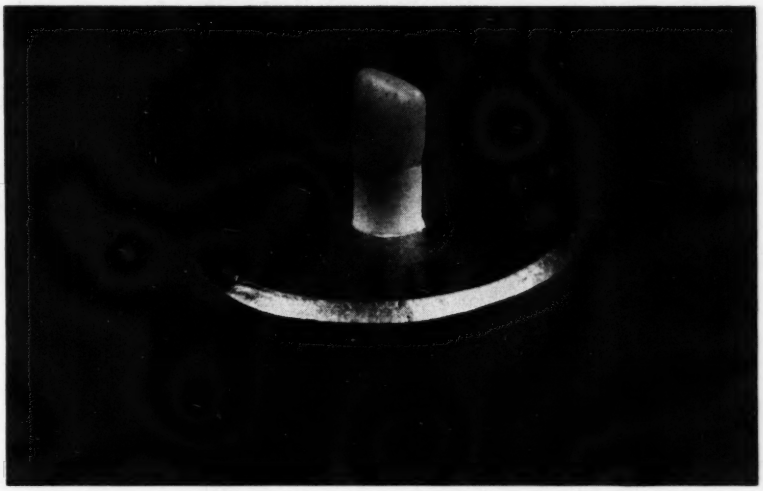


Fig. 8—Wax pattern for jacket crown in place on stone die.

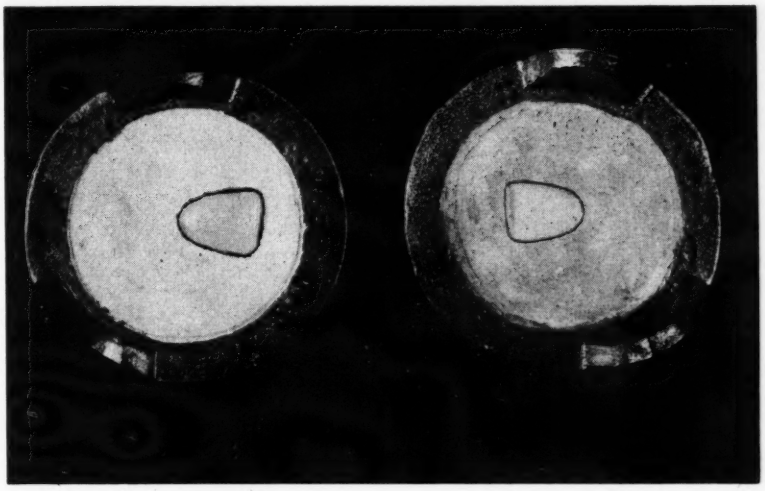


Fig. 9—Wax pattern and die invested in flasks.

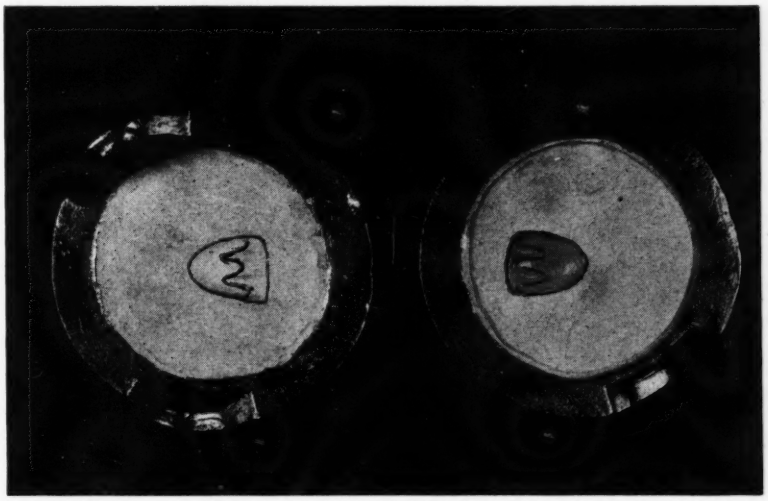


Fig. 10—Portion of wax pattern removed at incisal and second top half of flask poured.

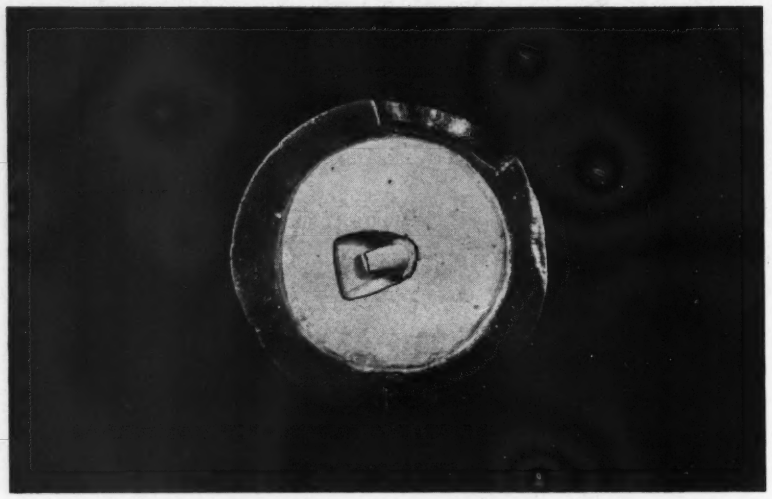


Fig. 11—*Wax boiled out and separating medium painted in.*

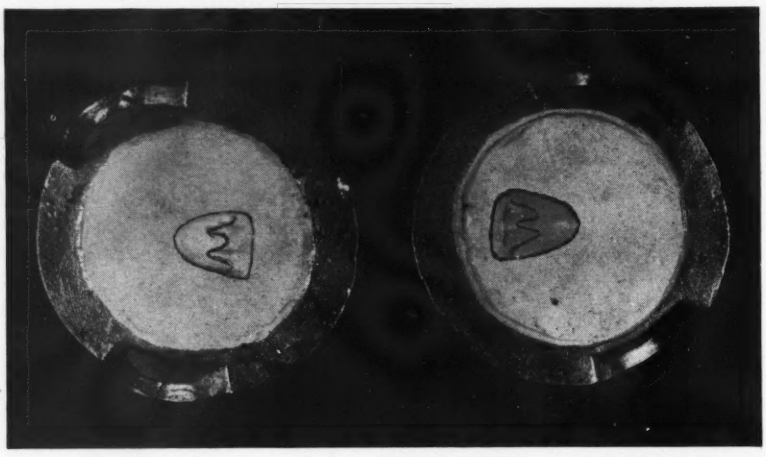


Fig. 12—*Using second top half of flask, pack body shade acrylic and boil* 10 *minutes.*

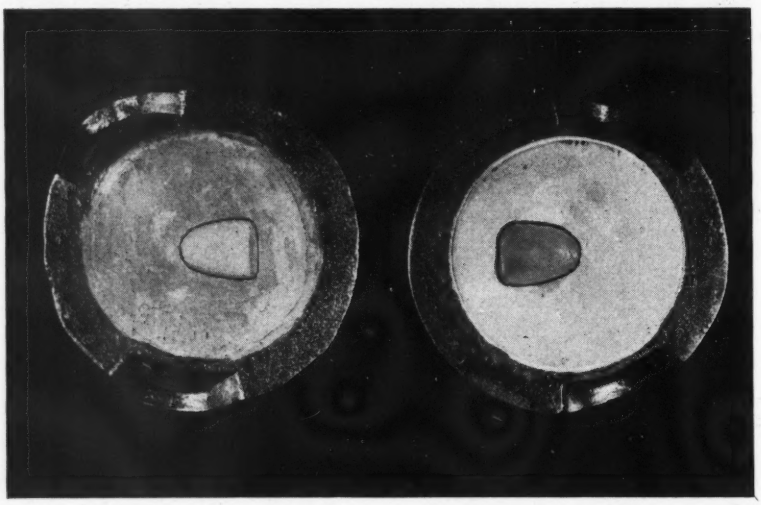


Fig. 13—*Using first top half of flask, pack the incisal shade acrylic. It is now ready for final curing.*

dropper until the powder becomes saturated. A fresh piece of cellophane is placed over the acrylic, the flasks returned to the press, and again closed. Trial packing is not necessary and the case is ready for processing.

9. Final Shaping. With a fine grain mounted stone, the thin feather produced by flasking is removed. The excess acrylic at the shoulder, produced by the bead of wax when the crown was sealed on the die, is now partly removed and the bridge is ready for the final try-in. When the patient returns for final insertion, the first step is to place the bridge in position in the mouth. By repeatedly inserting the bridge and testing with an explorer point, the final bit of excess at the shoulder is removed until a smooth butt joint is obtained. By comparison with the other teeth, mounted stones are again used to place the various grooves and indentations in the labial surfaces of the acrylic. This labial anatomy should be slightly exaggerated or prominent for it will be greatly modified by polishing. When all the requirements of anatomy and occlusion have been satisfied, begin the final polishing.

10. Final polishing. The acrylic is first smoothed down with fine pumice on a wet rag wheel. The final polish or lustre is obtained by using moist French chalk or whiting with a dry rag wheel. The interproximal grooves should be smoothed and polished by drawing a length of string saturated with pumice through them. This will greatly reduce the danger of cracking at these points. It has been proved that any "raw" scratch or cut in a plastic material is a weak point subject to cracking under stress and that polishing out this defect, even though it reduces the bulk of material, will increase the strength of the material at the weak point.

11. Cementation. It is necessary to test the shade of cement to use, due to the translucency of acrylics. It is advisable to have on hand these four shades of cement: snow white, pearl gray, yellow, and cream. It has also been found convenient to keep on hand a supply of burnt umber powder, an inert pigment used in oil painting. In many instances this pigment has been useful in "toning down" the brightness of cream and yellow cements. If jacket crowns are being cemented, the testing should

be done by mixing the powders with water. Glycerine is extremely painful and when used for this purpose produces prolonged sensitivity and discomfort to the patient. After the proper shade of cement is selected, the preparations and the prostheses are cleaned, dried thoroughly, and cemented in the usual manner.

Acrylic Inlays

Our experience has led us to prefer jacket crowns to inlays for anterior teeth. Either the carious area was small enough to be restored satisfactorily with silicate cement or else a jacket crown was made. There are instances, however, when it seems necessary to make esthetic restorations in the bicuspid areas. A two-surface acrylic inlay is often the answer to such a problem. For best results with this type of restoration a different method of preparation and flasking is used.

Preparation—Again the cavity walls should be nearly parallel. The occlusal dove-tale should be large and proximal grooves prominent. It is also advisable to include an extra groove across the cervical seat and across the pulpal floor of the occlusal dove-tale.

Flasking and Processing—A direct wax pattern is made and sprued at the contact point on a wax cone (Fig. 14). The pattern is then painted with a mix of artificial stone (Fig. 15). When this has set, the pattern is invested completely in a mixture of 50 per cent stone and 50 per cent plaster in the lower half of the flask (Fig. 15). The wax sprue is then scooped out and the top half of the flask poured in stone (Fig. 15). This produces an injection-molding technique which results in a harder restoration without the expense of special injection-molding flasks and equipment. As before, the remaining wax is now boiled out, separating medium painted in, and the excess blown out; then the flasks are allowed to cool. Acrylic is mixed and, when proper consistency has been reached, is forced into the void with a blunt instrument. The remaining acrylic is placed into the sprue-hole to an excess and the flasks closed in the press. Only one closure is needed since the entire pattern is invested and, in this case, incomplete closure is desirable.

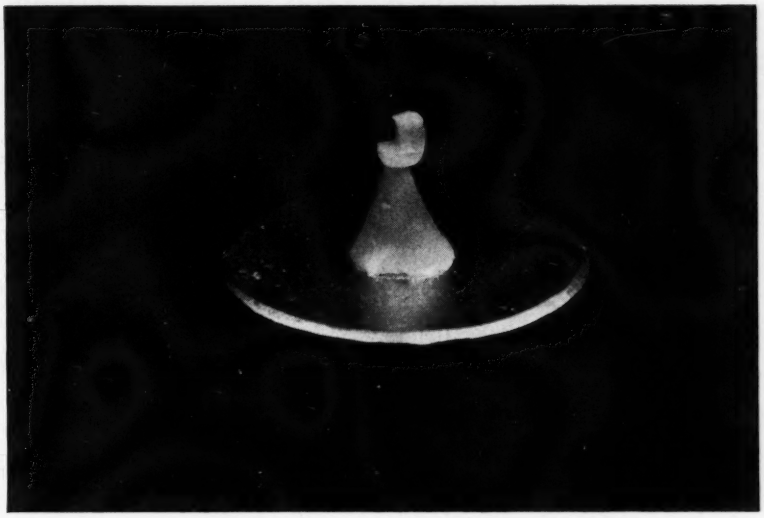


Fig. 14—Wax pattern, sprued on wax cone, ready for investing.

Final Steps—After processing, the inlay is removed from the stone and, if the technique has been followed accurately, will be found to separate cleanly (Fig. 16). The sprue is then trimmed off and the restoration inserted. Final polishing and adjustment of occlusion is done after cementation.

A restoration done by this method will prove to be quite accurate and durable (Fig. 17). This packing technique cannot be used satisfactorily for jacket crowns and bridges because it is extremely difficult to obtain shade variations within these restorations.

Other Uses For Acrylic

1. Pontics for fixed bridges. Often when making posterior bridges, gold crowns or inlays are used for attachment. The space to be filled, however, may present a problem either in size or occlusion. The abutment attachments are joined by appropriate framework and the pontic waxed up. This wax-up can be returned to the mouth and the patient allowed to grind his own occlusion in the wax before processing the pontic in acrylic.

2. Fixed-bridge facing repairs. The backing is cleaned of all traces of ce-

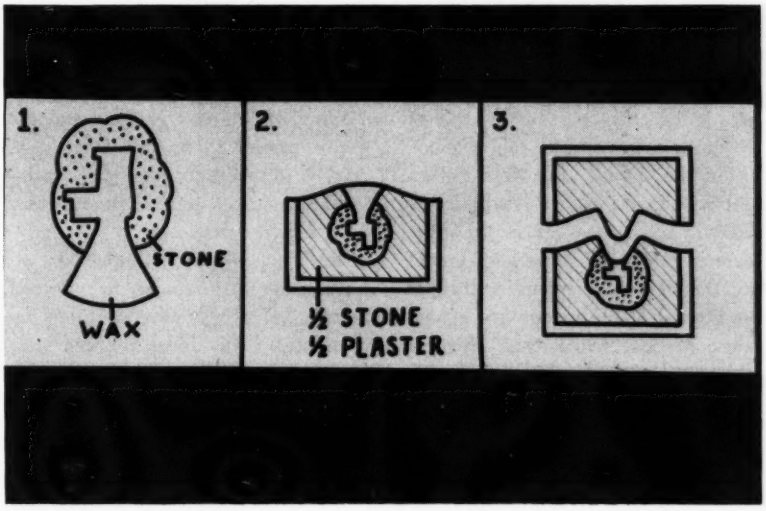


Fig. 15—Successive stages of investing inlay pattern: 1. Stone painted on pattern. 2. Flasked in plaster-stone mix. 3. Sprue scooped out and top half poured.

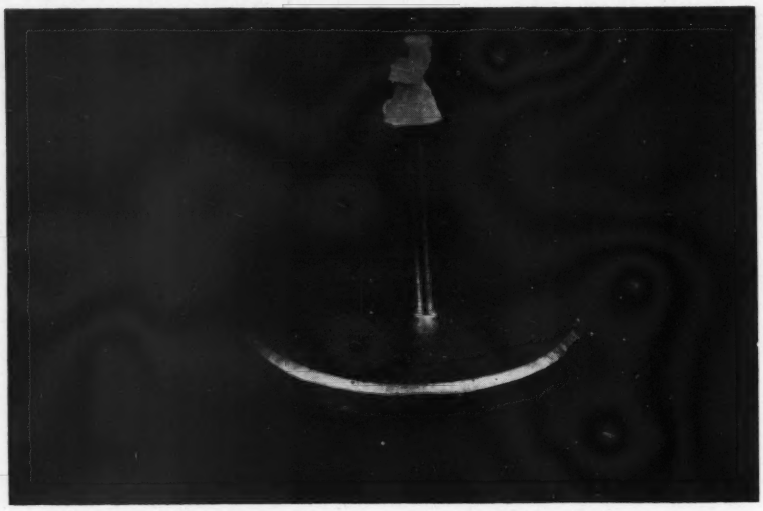


Fig. 16—Acrylic inlay, untouched, as removed from stone investment.

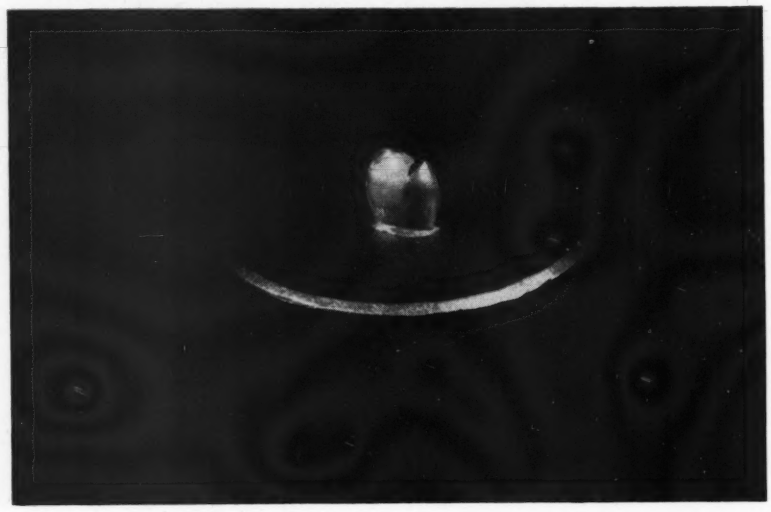


Fig. 17—Finished acrylic inlay in place on model.

ment and porcelain and two holes drilled with a #700 fissure bur. Clasp wire is then bent to a "U" shape, fitted in the holes, and the facing waxed up in the mouth. The wax pattern with wire loop included is withdrawn, flasked, and processed in the usual manner. After polishing and cementing, the loop ends protruding through the lingual of the bridge are ground down and burnished over. This creates extra mechanical retention.

3. Replacing broken tube teeth in partials. Wax is placed in the area formerly occupied by the porcelain tube tooth and the partial denture breaking up of sets for a single tooth replacement.

5. Davis or post crowns. One of the unpleasant features of crown and bridge work is the grinding of any ready-made porcelain crown to fit a prepared root surface. To make an acrylic post crown, the root end is prepared in the usual manner and a post fitted to the root canal.

a) A copper band impression of the root end is taken; the metal post is withdrawn in the impression. This is then poured as a model and the crown waxed indirectly. This necessitates an extra appointment for the wax try-in.

b) Root surfaces are prepared as before and a metal post is fitted. A celluloid crown form is then contoured to fit the root, filled with softened ivory wax, and pressed over the metal post and root end. Where necessary, wax may be added to the outer surface of the crown form to complete the contour. With the post securely gripped by the wax, the pattern is removed and flasked in the usual manner. Acetone will aid in softening the celluloid crown form prior to boiling out the wax and packing the acrylic.

6. Reproducing any odd anatomical forms or restoring unusual spaces.

returned to the mouth to obtain proper occlusion. Final shaping and carving of the wax is done and the entire partial invested in the flask. Acrylic is then processed directly into the denture; this eliminates any need for cementation.

4. Replacing broken teeth in all types of denture repairs. Acrylic can be adapted to any type of tooth replacement. It is ideal for use with acrylic denture bases since a strong chemical union is affected. This also eliminates the need of keeping large selections of teeth on hand, or the

Conclusion

There is nothing complicated about the use of acrylics to prevent the practitioner from working with them himself in his office laboratory. Acrylics will solve many little problems that confront him and will obviate the necessity of keeping large stocks of teeth or facings on hand. The uses set forth in this article do not include all the possible ones for this material; they are, however, intended to interest the practitioner in a relatively new field and to familiarize him with it. Frequent use will not only increase his skill in handling acrylic, but will undoubtedly enable him to find further application for the material.

Regional Hospital Dental Clinic

A Method for Combining Gold and Acrylic in Fixed Bridge Pontics

MISCHA KROOP, D.D.S., Brooklyn

Strong and hygienic pontics are required in fixed bridges for certain difficult restorations. Doctor Kroop outlines a method he has developed for the construction of gold-cusped, acrylic-resin pontics which fill this need.

THE NEED FOR modern fixed bridges is often encountered in cases in which extracted bicuspids or molars have not been replaced. Pontic replacement is a problem in these cases because either the posterior occluding teeth have shifted to fill partly the edentulous space; or the teeth adjacent to the space have tilted toward it to such an extent that they have left little or no room for a pontic.

A porcelain pontic would be too thin to resist the normal stresses of mastication due to the lack of either occlusogingival or mesiodistal space, and fracture would ensue. A design for pontic construction must be used which is sufficiently strong to resist the stresses of normal mastication while retaining the desirable quality of sanitation.

The cast gold-cusped, acrylic-resin pontic conforms to both of these standards. It has not been used extensively because of difficulties in construction, but I have been able to overcome most of these difficulties in my practice and now employ this type of pontic quite frequently in restorations. The technique I have adopted for its construction is outlined herewith.

Technique

After the abutments have been properly constructed and fitted to the abutment teeth, a plaster impression is taken of the area including the abutment teeth and the edentulous space. A model is poured in heat-resisting material which is separated and articulated when it has set.

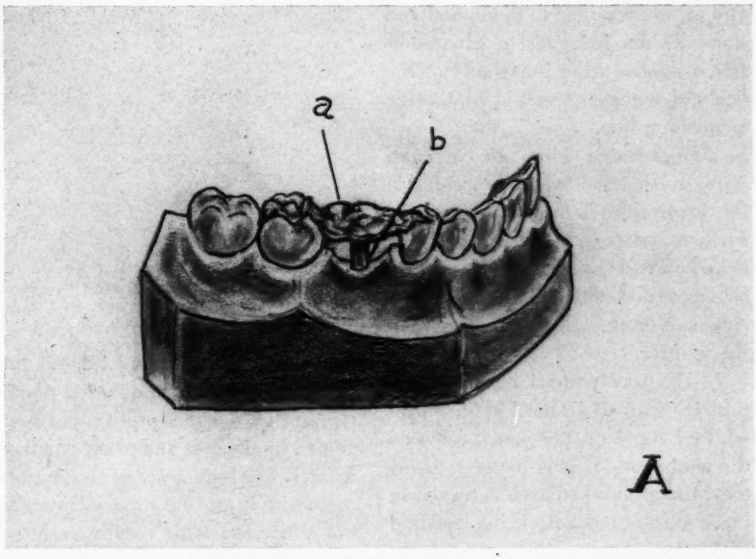


Fig. A—Occlusobuccal view of the cast bridge without the pontic. a. Gold cast occlusal surface. b. Corrugated post.

1. The first step in constructing the pontic is to build a waxed occlusal surface. This is accomplished by lubricating the abutment teeth of the

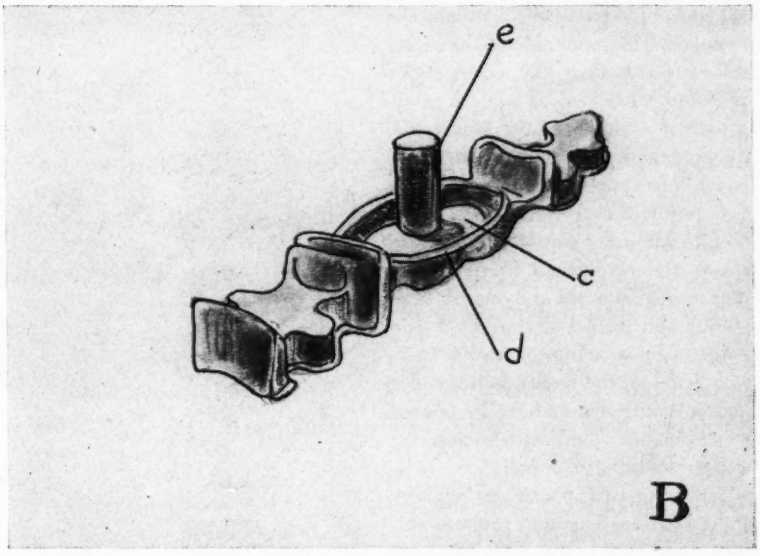


Fig. B—Inner view of the cast bridge without the pontic. c. The inner surface of the occlusal cast. d. The finishing rim of the cast occlusal surface imparting depth to the inner side of the cast. e. Corrugated post.

model, as well as the edentulous area, and introducing softened inlay wax in the edentulous space. The articulator is then closed. This operation leaves an impression in the wax by the occluding teeth.

2. The wax is carefully carved to the anatomic structure of the occlusal surface, removed, and trimmed to about one-sixteenth of an inch in thickness occlusogingivally. A thin rim of wax is added to the buccal and lingual sides in order to give additional depth to the inner side of the occlusal surface as well as to provide a finishing line.

3. High-fusing, 14-gauge, corrugated wire is embedded in the center of the inner side of the waxed occlusal surface, pointing gingivally and perpendicular to the surface. This serves as a post and should be at least one-sixteenth of an inch short of reaching the gingiva.

4. The wax pattern including the post is then cast in hard gold, finished, and fitted on the model between the abutments. If it is found satisfactory, the occlusal surface is tacked in place on the model, being secured with sticky wax to the abutments on the inner side of the occlusal surface.

5. A plaster alinement-matrix of the occlusal surfaces of the gold castings and the abutments is poured next. Care must be taken to lubricate these surfaces prior to this operation. When the plaster is set, the matrix is removed. The inner side of the occlusal surface is then cleaned of sticky wax and lubricated as are the interproximal surfaces of the abutments, the post, and the gingival part of the edentulous span on the model.

6. Softened ivory wax is now pressed into the inner side of the gold occlusal surface, against the post, and put in position on the model. The plaster alinement-matrix is used as a guide. The carving of the wax is completed on the model, and another plaster alinement-matrix is poured which includes the buccal surfaces as well as the occlusal ones.

7. The waxed pontic is removed and put aside. The gold occlusal surface is attached to the abutments with sticky wax and finally cut out from the model, invested, and soldered.

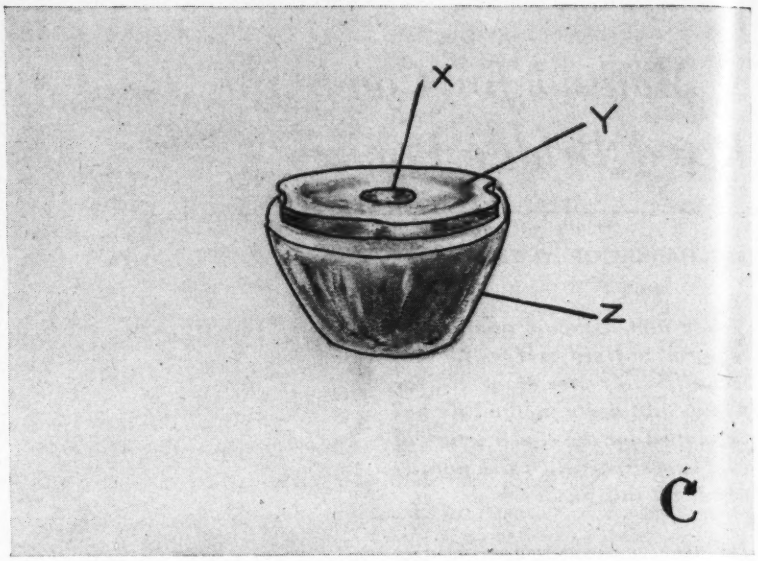


Fig. C—View of ivory-waxed pontic tilted buccally. x. Orifice leading to the canal formed by the corrugated post. y. Raised surface of the ivory wax which fits into the deep portion of the inner side of the occlusal cast. z. Buccal view of the wax pontic.

8. When the skeleton bridge is finished and polished, the waxed pontic is inserted in the proper position, guided by the post and plaster matrix. After it has been secured to the gold cusp with wax, the case is invested and processed with acrylic resin of the proper shade.

9. The bridge is recovered from the investment when it has cooled sufficiently; the acrylic-resin tooth is finished, and the entire unit polished prior to insertion in the mouth.

Conclusion

It may be seen that this type of pontic possesses the two qualities most desirable for certain difficult replacements—sturdiness and sanitation. The gold cast occlusal surface renders the pontic sufficiently strong to resist the normal stresses of mastication, whereas the acrylic resin in contact with the gingiva has the attribute of tissue tolerance.

(*Continued on page* 493)

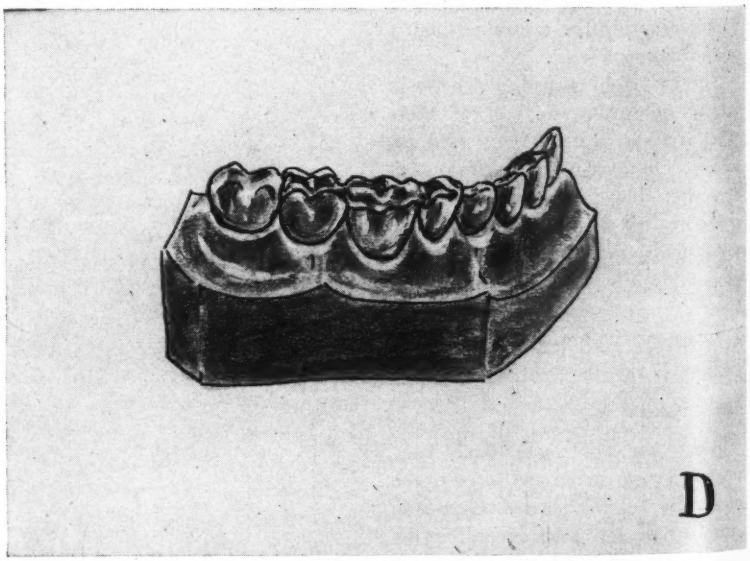


Fig. D—Occlusobuccal view of the completed bridge showing the acrylic-resin molar pontic processed to the occlusal casting.

The Editor's Page

MOST DENTURE wearers tolerate their appliances and have function that varies from poor to very satisfactory. The small percentage that will not keep their dentures in position are unhappy sights to themselves and to their families and friends. To us dentists they are humiliating symbols of our failures.

Some people will not wear dentures because they experience physical discomfort. In virtually all cases, sore spots may be prevented by proper construction and certainly by intelligent adjustments. No one should be required to suffer any considerable time from a denture-sore mouth.

Those who will not wear dentures because they have pernicious habits that unseat the base by violent muscular grimaces and thrustings require stern self-discipline or an exploration of their psyche. They are beyond any help a dentist can give except that which comes from strong talk. There are some patients, however, who have poor tissue tone, unsatisfactory ridges, or a muscular decompensation that has resulted from general disease or a cerebral accident. Such patients want dentures. They are patient and persistent. But despite their favorable attitudes, these people cannot retain dentures regardless of the excellency of the planning and construction. In these cases, the internal fixation method described by Skinner and Robinson on page 427 of the August issue offers a possible solution.

It might appear to some critics that a method of denture stabilization by attachment to an intraosseous metal implant is an extreme procedure. It is, but it is better than having a person spend his years in the edentulous state. An internal osseous fixation for dentures is not suggested as a routine procedure but as one that should be elected after ordinary methods are proved unsatisfactory. The conspicuous success of internal fixation by non-irritating metal mechanisms is a bright page in present-day orthopedic surgery. The application of the principle to denture procedures is an intelligent combination of good surgery and good mechanics.

In their first experiments, Skinner and Robinson used an implant that was submerged in the cancellous bone of the jaw. They found that when the denture was attached to such an implant, the stress was so great that hypermobility developed and that retention was not satisfactory. In the method used at present, a channel is created through the bone that extends from the buccal to the palatal or lingual with the implant exposed on both ends. The palatal or lingual portion of the implant is a hollow threaded tube with an enlarged end that prevents displacement. The buccal portion is a screw that is threaded into the tube. The head of the screw is designed to accommodate a precision attachment incorporated in the denture.

In using this mechanism, a careful preoperative roentgenographic study is necessary in order to make certain that the implant is placed in areas free from vital structures. In the maxilla it is necessary to place the implant anterior to and below the floor of the maxillary sinus; in the lower jaw the tissues in the mandibular canal and in the region of the mental foramen must be avoided.

No surgery is to be considered lightly. It would be a grave mistake if dentists were to use internal bone fixation as a routine procedure. In those cases that give a history of intolerance to dentures, however, the method offers a solution of a dental problem if used by skillful hands after careful diagnosis and planning. A strong warning should be issued to those dentists whose surgical zeal runs ahead of their surgical judgement and skill.

The Use of Ethyl Chloride by the General Practitioner

S. A. FORMAN, D.D.S., Cleveland

Doctor Forman believes that certain adverse opinions concerning the use of ethyl chloride as an anesthetic in the office should be corrected. Study and experience are required for the successful administration of any anesthetic; he maintains that a careful and observant practitioner can train himself in the use of ethyl chloride, too.

Advantages

1. It is easier to learn to administer ethyl chloride than to administer nitrous oxide. The manipulation of an apparatus is eliminated and one is able to concentrate on the patient. There are no dosages or controls to set; therefore the dentist need not be concerned about the assistant giving the patient proper doses or mixtures. He is both operator and anesthetist. The head and face are free of equipment when the mask is removed and the operation is begun.

2. Ethyl chloride is an ideal anesthetic for the simpler extractions and for surgical procedures requiring a short operating period.

3. Age is not a factor to be considered in administration, as the chart (Fig. 1) indicates.

4. Chair time is reduced to a minimum. For the crying, uncontrolled child, the one with whom one cannot reason, this is a procedure which will not leave the child fearful of the dentist for the rest of his life. I have eliminated almost completely the use of local anesthetics for children's extractions; ethyl chloride is quicker and easier, and the child is not so afraid.

5. Patients recover promptly and completely and do not require a bed; ethyl chloride is therefore ideal for the ambulatory person. A vomiting patient is very rare, even when he is unprepared and has just come in from the street.

Indications for Use

If the patient is able to climb the stairs and walk into the dentist's office, ethyl chloride is rarely contraindicated. Persons with heart disease, respiratory difficulties (tuberculosis, bronchitis, large tonsils), kidney disorders, anemias, etc., of course, are liabilities for any anesthetic. I do not examine the patient with a stethoscope but I gather information about him by casual examination and conversation. His general health? Can he hold his breath for 20-30 seconds? The color of finger nails, lips—all these are noted. Too many direct questions and a thorough physical examination may make the patient unduly concerned. Enough of the patient's history is obtained by indirect questioning to enable one to decide whether the use of a general anesthetic is desirable.

For a longer operating period such as for extensive surgery and impactions, etc., where more relaxation is desired, nitrous oxide is required. Ethyl chloride gives incomplete relaxation, a light stage of surgical anesthesia which is ideal for short operations. Many men have extended the use of ethyl chloride for an hour or more successfully; we are interested here only in brief surgery.

Common Objections to Use

Dentists have been hesitant about using this anesthetic. They not only do not discuss ethyl chloride; they dismiss it as "dangerous." If actual trial and demonstration were witnessed, more dentists would be convinced that ethyl chloride has a suitable application in the general practitioner's office. Lack of knowledge of its use is no reason for condemning an anesthetic.

1. In my own five years' of experience using ethyl chloride and in the experience of others covering a lifetime of use, no alarming or untoward effect has occurred. The risk involved in the "closed method," where rebreathing was employed, prejudiced many against ethyl chloride. In this method a fixed amount of ethyl chloride, contained in a vial, was dropped into a closed bag from which it was inhaled. This was dangerous because the products of decomposition from the lungs were rebreathed and the patient practically suffocated. Ethyl chloride administration by the "open method," however, where plenty of air is mixed in, is one of the safest anesthesias for short operations. According to the medical literature, ethyl chloride is safer than ether, and we all know that the latter is used extensively.

2. It is maintained that ethyl chloride has a "narrow margin of safety," that the amount of anesthetic required to bring the patient to the anesthetic stage may approch a lethal dose. Actually there is nothing to be concerned about except that the administration be stopped as soon as the anesthetic stage is reached.

3. The inflammability of ethyl chloride is about equal to ethyl ether or vinethene. Ordinary precautions should therefore be taken in using the anesthetic. There should never be an open flame in the room when an inflammable anesthetic is employed. Nowhere in my perusal of the literature, however, have I seen recorded the occurrence of any accident attributable to the drug's inflammability; nor have I heard of any. A manufacturer with forty years' experience

in the manufacture of ethyl chloride has confirmed my statement.

Dosage

ACCEPTED DENTAL REMEDIES states: "The amount used should not exceed 2 cubic centimeters for children and 5 cubic centimeters for adults." This, I believe, refers to the "closed method." As the chart (Fig. 1) indicates, I have employed from 2½ to 42 cubic centimeters, depending on the patient, length of operation, temperature of room, etc. In using the "open method," some of the ethyl chloride is lost by evaporation in the air. I have seen more than 100 cubic centimeters used by administering repeated doses for one operation.

As soon as the anesthetic begins to wear off and the patient shows signs of awakening, more ethyl chloride may be administered repeatedly without ill effect, if more time is required to complete the operation. I have done this occasionally when a procedure necessitated it; but I do not make a practice of prolonged administration since I do not use ethyl chloride for lengthy operations. I have seen it successfully accomplished, however, time after time.

The statement has been made that ethyl chloride has a "cumulative effect," that when the anesthetic is removed, the patient goes into a deeper stage of anesthesia. This is merely due to inhalation of the anesthetic vapors remaining in the lower respiratory tract and one need not be alarmed about it.

Technique

An extensive description of the properties and physiology of ethyl chloride is given in the literature; the discussion here stresses a practical technique for the administration of ethyl chloride in the dental office. It can be altered or adjusted by other operators with practice. It is the summation of many techniques that I have used, witnessed, or become familiar with through the literature and which I have refined according to actual clinical experiences. I employ this technique and think it is best. The proponent of any one anesthetic or technique has worked out a plan

NO. OF CASES.....100.. Male 56; Female 44
NO. OF EXTRACTIONS....216.. Permanent Teeth 102 (6 roots)
Deciduous Teeth 114 (13 roots)
SINGLE TOOTH EXTRACTIONS....46
MULTIPLE EXTRACTIONS:

28 cases	2 teeth extracted	3 cases	6 teeth extracted
12 cases	3 teeth extracted	1 case	8 teeth extracted
2 cases	4 teeth extracted	1 case	9 teeth extracted
3 cases	5 teeth extracted	1 case	20 teeth extracted

AGE OF PATIENTS (average).....15.72 years
Youngest ..... 3 years
Oldest .....64 years
CHAIR TIME* (average) .....4.59 minutes
Shortest ..... 2 minutes
Longest .....20 minutes
NO. OF CC.'S OF ETHYL CHLORIDE USED (average)....12.64 cc.
Minimum Quantity Used in a Single Case ..... 2.5 cc.
Maximum Quantity Used in a Single Case .....42.0 cc.
HEALTH OF PATIENTS .....90 Good Condition
4 Fair Condition
6 Poor Condition

STATUS OF 6 PATIENTS IN POOR HEALTH AND OPERATIVE RECORD OF EACH

Patient	Age	Sex	Extracted Teeth	Chair Time	No. cc.'s	Wt.	Post-operative Reaction
Exophthalmic Goitre Case	34	F	1 permanent	4½ min.	30	112	None
Rheumatic Heart Case	19	M	9 pyorrheic	15 min.	29	160	None
Mute, Sickly Youngster	7	M	1 deciduous	2 min.	7	70	None
Nose Cold Case	21	F	1 permanent	3 min.	10	130	None
5-Mos. Pregnancy Case	24	F	1 permanent	10 min.	17	150	None
Habitual Fainter; Hyperneurotic Case	19	F	1 permanent	4 min.	20	110	None

First "gas" Experience for.....75 (of 100 cases)
Slight Retching ..... 4 cases
Vomiting** ..... 1 case
(ate one hour previously)

*This is the period beginning with the administration of ethyl chloride and ending with the patient leaving the chair of his own free will. It includes: induction, operating, and recovery periods.

**20 of 100 cases had partaken of food from ½ to ¾ hour previous to anesthesia.

I noticed no particular relationship between the weights of individuals and the numbers of cubic centimeters employed for anesthesia, nor between sexes and numbers of cubic centimeters. Neither was there any relation between quantity of ethyl chloride employed and "chair time."

Chair Time	Cubic Centimeters	Chair Time	Cubic Centimeters
2½ min.	10	2 min.	9
20 min.	11	4 min.	6

One youngster, frantic with fear yet suffering badly, would not leave his parent's arms. A mask saturated with ethyl chloride was placed over the face of the crying child; in a few seconds he was carried to the chair where further anesthesia was given and the operation successfully completed.

Fig. 1—Clinical Analysis of 100 Cases of Ethyl Chloride Anesthesia

Fig. 2—(A) (upper left) Wrong position; head too far back; neck muscles and airway strained. (B) (upper right) Wrong position; head too far forward; when jaw is propped open, mandible obstructs airway. (C) (lower left) Proper relaxed position; jaws propped. Gauze on mask is being saturated with ethyl chloride away from patient. (D) (lower right) Mask is brought down gradually on patient. Palm cupped around mask warms gauze, prevents freezing of sprayed ethyl chloride.

which gives him the best results and is most dependable in his hands. This is the one in which I myself feel absolute confidence. It is not revolutionary or new; it is just a practical plan.

Preparation of Patient

1. Abstaining from food three or more hours before the anesthetic is advisable. A long fast is not necessary; it may, in fact, be harmful. Many times ethyl chloride is em-

ployed in an emergency when no thought can be given the matter of food. Seldom is there nausea or vomiting. The ease of patients' recovery is remarkable and patients are surprised that they have been asleep.

2. The bladder is emptied; tight belts and collars are loosened.

3. Rarely use premedication; for extremely neurotic adults, prescribe 1½ grains of sodium pentobarbital twenty minutes before anesthesia. Always have someone escort those patients on the street who have received this medication.

4. Before seating the patient, all instruments for the procedure should be arranged on a tray and *covered with a towel* to avoid frightening the patient. Everything must be at hand and ready when the operative work is begun. It is necessary to work quickly; one must not stop to look for instruments after the patient is under anesthesia.

Seating Patient

See that the patient is in a comfortable, relaxed sitting position (Figs. 2C and 2D).

1. The patient's head should not be too far back or too far forward (Figs. 2A and 2B). Normal position for most people is *head forward* of shoulders. The patient's neck muscles must not be strained; an open airway is essential since the breathing apparatus cannot function well under tension. The patient should be in an upright position, head forward. This also prevents blood, metal objects, or an extracted tooth from falling back down into the esophagus or trachea.

2. The child can sit normally or with legs crossed under him. His feet can be held by the assistant to keep him from slipping down in the chair.

3. It is nice to cover the patient with the vinylite type of apron to protect his apparel.

4. Restraining straps are used occasionally on adults, but never on children under ten years. Several yards of dish toweling material make good straps or belting with buckles, obtainable at a harness shop, can be used (Fig. 2). The straps are adjusted over the patient's lap; in this way knees and hands are protected.

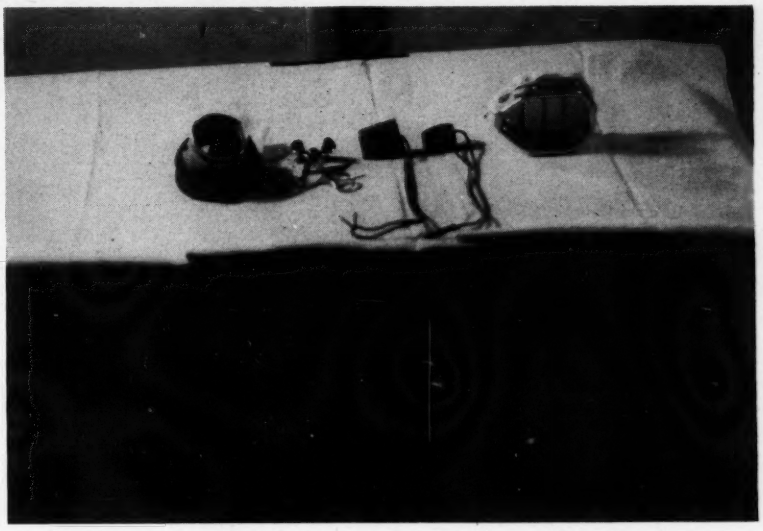


Fig. 3—Rubber respirator (left) used in industrial work with filter removed and gauze substituted. Metal and rubber mouth props (middle) with strings attached. Adjustable metal mask (right), ideal for adults, has large gauze surface area for spraying.

Explain to the patient that this is done to keep him from slipping onto the floor; as is natural when he sleeps, the tendency is to lie down. This requires the operator to keep lifting him back into the chair. Some patients also have dreams. They may swing their hands, making it difficult for the assistant to keep them down. The small child, on the other hand, can be handled.

5. Note that the straps are left on until recovery. I have found that the patient who insists on gas is usually very cooperative but take no chances with a muscular individual; use straps or it may be hard to keep him in place.

Use of Mouth Props and Masks

There are adjustable (Denhardt) metal props and rubber mouth props in assorted sizes (Fig. 3). I usually employ the rubber props and in cases of multiple extractions, on both sides of the mouth, I use a combination of both. The prop is placed between the teeth on the side of the mouth opposite to the side from which the teeth are to be extracted (Fig. 4).

1. Prop technique for multiple extractions. If first molars (Fig. 5) are to be removed, place the usual rubber prop on the right side, anesthetize the patient, and complete the extraction on the left side. Have a metal prop ready; place it in position on the left side, remove the rubber prop on the right side, and complete the right side extraction.

2. Rubber tubing should be employed on metal parts of the prop coming in contact with the teeth. Care should also be taken not to hurt the patient's lips, his tongue, and the healthy teeth.

3. The patient should bite firmly on the prop. His mouth can be opened wider with the metal prop as he goes into anesthesia.

4. A strong string should be fastened onto the rubber prop for safety; this is left hanging out of the mouth. Some dentists attach a rubber prop to each end of a string and alternate in this way; some use metal props entirely. No prop may be necessary if only one easily extracted tooth is to be removed. A piece of cork or gauze may suffice to separate the teeth so that the operator can get in and open the jaws for the operation. Do not hesitate to force the mouth open when the patient is under anesthesia.

5. I have anesthetized patients without props and have found that their jaws were so tightly closed that I could not open them until some of the anesthesia wore off. Telling the patient that when he feels dizzy and sleepy he should keep his mouth open is a somewhat prehypnotic suggestion which works many times. Employing a gag or a prop is a surer method.

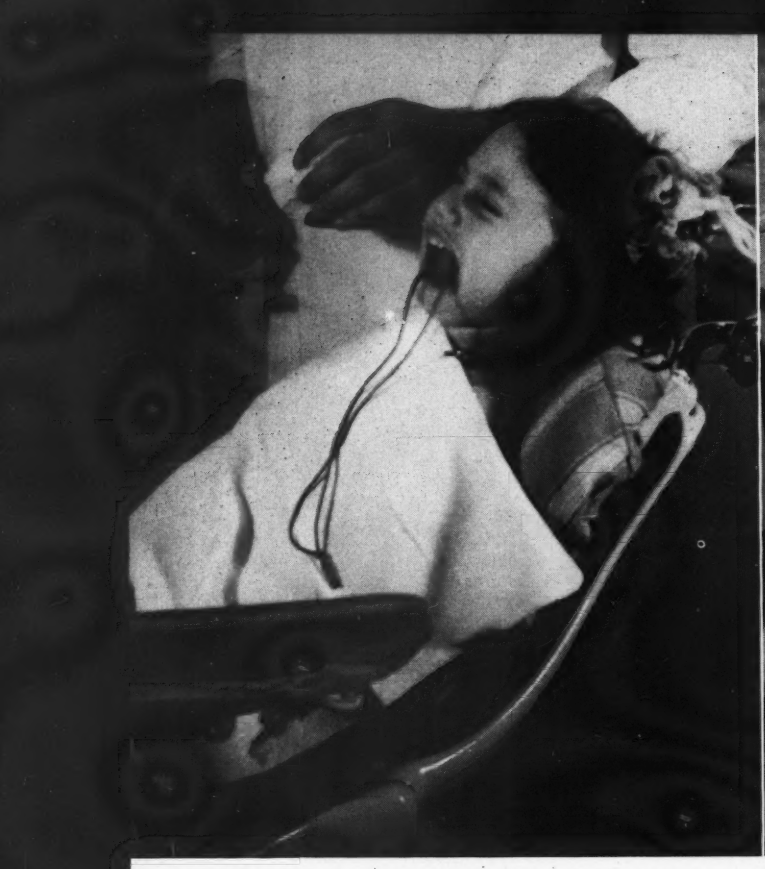


Fig. 4—Rubber prop placed on side opposite to side from which teeth will be extracted.

Fig. 5—Using combination of rubber and metal props. Note that the legs are crossed.

6. I use an adjustable metal mask for adults and a rubber one for the child (Fig. 3). These masks are covered with four or five layers of gauze. An old rubber mouthpiece from a nitrous oxide outfit, with the top cut out; or a respirator used in industrial plants, with the filter removed and gauze substituted, are ideal for the child.

Anesthetization Procedure

1. Use a drop of perfume on the fingers; let the patient breathe this first.

2. Saturate the gauze layers on the mask by spraying with ethyl chloride, away from the patient. Then gradually bring the mask down over the patient's nose and mouth until it is seated completely on the face, cheeks, and chin; then start spraying again. In this way, the first few breaths that the patient takes are mostly air.

3. If the mask is applied too quickly, the patient gets a high concentration of ethyl chloride vapor. This will irritate the larynx, causing a reflex action and a momentary arrest of respiration; also, due to spasm of the vocal cords, some anesthetists have observed a peculiar "crowing" of the larynx. I have heard this described but it has never occurred in my experience.

4. The mask should be removed for several seconds and a checkup made to see that the airway is clear. Traction should be used on the tongue.

5. Start with a light concentration and increase it gradually so that anesthetization goes along smoothly (Figs. 2C, 2D, and 6). Hold the bottle about 10 inches from the mask and spray at an angle.

6. I always tell my patient that the anesthetic is like breathing cold air, especially the first breath; then the patient is ready for it. I usually do not tell him *how* to breathe for he will then try to keep awake as long as he can.

7. As the child is going under, I talk to him, telling him that he will see a picture show, Mickey Mouse, Lone Ranger, etc. Direct the child to blow the cool air away, should he be hesitant, and naturally he will have to inhale. If he holds his breath, merely press on his stomach several times; this pressure on the diaphragm is effective in overcoming the breath-holding.

8. I also talk to the adult, asking him after a little while if he can hear me. At first he nods, and later there is no answer. One can check reflex by pinching the cheek or hand.

9. Some dentists have the patient count as he goes under the anesthesia; at about eight or ten, they proceed. Others have the patient raise his hand and keep it there as long as he is able; when it drops, they proceed.

The majority of patients exhibit no excitement at all during administration. They take it smoothly and peacefully. Those who ask specifically for "gas" are usually good patients. Consciousness is lost in from one-half minute to one minute's time. The operating period is from one to two minutes or longer.

Precautions In Applying Ethyl Chloride To Mask

1. The bottle should be kept about ten inches from the gauze; holding it much closer will cause the drug to freeze on the gauze.

Fig. 6—Position of bottle sprayed at an angle and directed away from face.

Fig. 7—Tongue pulled forward (grasped with napkin); pressure applied under diaphragm.

2. A large surface of gauze should be used and sprayed all over, while the palm of the hand is used to warm the gauze (Figs. 2C and 2D). In a cold room, ethyl chloride volatilizes more slowly; placing the palm as indicated warms the gauze and volatilizes the anesthetic. The failure of ethyl chloride to volatilize is often the cause of failure to anesthetize the patient. Intermittent spraying helps volitization also.

3. Spray at an angle, so that the spray is directed away from the face and eyes.

Stages of Anesthesia

Some of the difficulty with ethyl chloride administration comes about because it is hard to follow the four stages of anesthesia as they are usually presented in the medical literature. Anesthesia takes place rapidly; the stages merge quickly and are fleeting. Instead of describing these stages, which have been stressed time and again, I wish to advise the operator to note first of all: (1) the patient's respiration and then (2) eye signs and color. By becoming proficient in noting depth, rate, etc., of respiration, plus eye signs as an extra aid, one will know when the patient is doing well, when he is in the operating stage, and when he is in danger.

Respiration—This is the most important process to observe in the administration of ethyl chloride. If it is watched and listened to with utmost care, ethyl chloride will be a safe and efficient anesthetic to use.

1. At first the respiration rate increases and expirations are greater in volume than inspirations. As anesthesia progresses, respiration becomes deeper and fuller. The main thing to listen to and watch for is the approach of regular rhythmic respirations, in which inspiration and expiration are alike in depth and volume, as though the patient were in a heavy sleep. Breathing may be accompanied by a quiet snore. *When the respiration is regular*, the operating stage has been reached.

2. You must watch, hear, or feel respiration. If you cannot hear, bring your ear closer. The fall and rise of the chest can be seen or felt. Should the respiration become irregular or jerky, remove the anesthetic, pull the tongue forward, using a napkin, and press rhythmically under the diaphragm (Fig. 7) until breathing is regular; then continue the anesthetic. The patient responds to this treatment.

3. If the patient coughs, lift the mask and check. It may be mucous gathering in his throat. If coughing does not stop, withdraw the anesthetic as at any bad sign.

4. To know what to do if respiration ceases is essential. If tongue traction and pressure under the diaphragm fail, some suggest cupping the hand around the patient's mouth inflating the lungs by blowing into them, and pressing on the diaphragm (Fig. 8). Other methods of artificial respiration can be employed; also, drugs such as atropine sulphate or strychnine sulphate may be used.

Eye Signs—It has been noted how, by watching and listening to the breathing alone, the operator can tell what stage the patient is in. By knowing "eye signs" he can be positive of his conclusions.

Fig. 8—Blowing into patient's lungs (inflating) and pressing under diaphragm.

Fig. 9—Patient's head tilted forward with basin under chin, the prop in place, as recovery occurs.

1. As ethyl chloride is sprayed, the eyeball begins to move from side to side.

2. As the spraying continues, the eye will come to rest and remain fixed in one corner or roll up or down. When it is in one plane, proceed.

3. In light anesthesia the eyelids may even remain open and the eyeball will move slightly.

4. In deeper anesthesia the eyeball is fixed and the lids are relaxed, since reflex is absent.

5. When the anesthetic is removed, one can observe the eye movements slowly starting again and then finally coming back to a normal state as the patient recovers.

Pupillary Changes—The pupil of the eye can also be watched. In the operating stage, with the eyeball fixed in one plane, the pupil may be unchanged or a little dilated. When the pupil is excessively dilated, the overdose stage has been reached; respiration fails and the patient may gasp and be very pale. In children there is dilation of the pupils very soon after a few whiffs of ethyl chloride and light anesthesia; as the anesthesia goes deeper, the pupils contract. A second dilation of the pupils is a danger signal.

Pulse and Other Changes—There are pulse changes after the first increase; blood pressure is higher at first and falls as the fourth stage is approached. By observing the chart, especially respiration, all will be well.

Muscle relaxation is greatest in the deep third stage; and when the patient's hand is lifted, it falls with a thud. This relaxation does not last very long and in most cases is incomplete. In the first, or analgesia, stage, the patient may cry out and offer resistance but has no recollection of it later. This analgesic reaction is obtained also at the end of anesthesia.

It is apparent from this discussion of the stages of anesthesia that respiration is the best guide to the patient's condition; other signs are just aids. The chart below summarizes the main characteristics of each stage of anesthesia.

Complications

Oxygen is an antidote for respiratory difficulties occurring during nitrous oxide anesthesia. The cyanotic patient needs oxygen.

Cyanosis—The open method of ethyl chloride administration, in which there is plenty of air, does not produce cyanosis. During the anesthesia the patient may be flushed but

	First Stage	Second Stage	Operating Third Stage	DANGER Fourth Stage
Respiration	In incline; exhalations greater than inhalations.	Respiration getting deeper and fuller.	Regular, rhythmic breathing. Slight snore.	Failure of respiration. Gasping, jerky, irregular breathing.
Eye Signs	Eyeball moves side to side. Lid reflex present.	Eyeball still moving slowly. Lid responds lazily.	Eyeball fixed. Lid reflex gone	*Pupil dilated.*
Color	Normal	Face may be flushed.	Flushed.	Extremely *pale.*

not cyanotic. If cyanosis should occur, the cause must be looked for elsewhere; it is not due to ethyl chloride but to obstruction somewhere in the respiratory tract. The position of the head or mandible or mucous, vomitus, blood, or any foreign object may block the airway. The tongue itself at times may do so.

1. Stop the anesthetic and check to see what is blocking respiration.

2. Bring the patient's head forward so that mucous, blood, or saliva will run out and free the airway.

3. If the tongue has fallen back, pull it forward with a napkin or tongue forceps.

4. Lift the mandible up if it seems to be cutting off the air.

5. As stated previously, a few rhythmic presses under the diaphragm and traction of the tongue will start breathing if it ceases. I have had a number of children who held their breath and this procedure started their breathing again.

Foreign Objects—Should some foreign object be lodged in the larynx or trachea of the child, one writer suggests holding the child up by the feet with his head hanging down, and at the same time "milking" the trachea to dislodge whatever may be there. Another suggests turning the child over one's knee with its head down, holding the chin up, and at the same time applying rhythmic pressure under the diaphragm. It is best, of course, not to allow such a situation to take place.

Syncope—This is a common office occurrence and one which is familiar to all practitioners. When there is a sudden change of color, stop the anesthetic, lower the head, and administer aromatic spirits of ammonia.

Shock—This is indicated by pallor, feeble pulse, and weak respiration. Keep the patient warm and apply stimulants. The patient in shock recovers slower than the patient in syncope.

Comments

Place a piece of gauze from the mask, or at least the finger, behind the tooth as it is extracted. Should the tooth slip from the forceps, this is then a valuable safety measure. The number of teeth one can take out, or the amount of surgery that can be performed, depend upon the ability of the operator. A throat pack, if used, must be placed to avoid gagging.

Do not yell at the patient or slap him to wake him. Let him awaken gently and slowly. If one has taken out several teeth and there is much bleeding and mucous, do not remove the mouth prop until the patient is completely awake. Keep the patient's head tilted forward with the basin under his chin (Fig. 9).

As a child recovers, go out and speak to his parent; reassure him that the operation has been completed. In a few seconds "Johnny" will be crying and getting lots of air into his lungs by yelling; the louder the yelling, the more air—and this is fine. All signs of operation, blood, and armamentarium should be covered or removed by the assistant before the parent comes into the room.

Children make up a large part of general practice. By employing ethyl chloride, one can more easily keep them as friends; the anesthetic is almost indispensable for this purpose alone.

The use of a patient-controlled ethyl chloride analgesia device has taught many dentists the value of ethyl chloride. Using the drug this way has given them confidence to employ it as a general anesthetic on a mask. Only single tooth extractions should be attempted until the operator gains experience and confidence, and overcomes his nervousness.

There are many pros and cons in the literature about the use of ethyl chloride. I have presented this technique merely because it is a suitable procedure for the office which achieves good results.

15003 *St. Clair Ave.*

A Method for Combining Gold and Acrylic in Fixed Bridge Pontics

(*Continued from page* 484)

It should be noted that these pontics may be used to replace two or more missing posterior teeth, in which case the procedure is the same as outlined.

Summary

The mechanics in the construction of gold and acrylic-resin pontics consist of the following:

1. Carving a waxed occlusal surface of a bicuspid or molar tooth and imbedding a high-fusing corrugated wire post in the inner side of it.

2. Casting the same in hard gold and waxing the finished cast to the abutments, according to occlusion.

3. Pouring two plaster alinement-matrices, one of the occlusal surfaces and the other of both the occlusal and buccal surfaces after the ivory-waxed pontic has been carved.

4. Removing the ivory-waxed pontic from the post and soldering the casting to the abutments.

5. Putting the wax pontic in position; securing it to the cast wax; investing it, and processing it according to shade.

378 *Kingston Avenue*

*Diatomaceous Earth Technique for Rapid Production of Gold Inlays**

RAY SWARTZ, D.D.S., Lompoc, California

A simple process for the rapid casting of gold inlays and pontics is described here. The advantages of this method originate in the nature of the investment material—diatomite.

DIATOMACEOUS earth is the skeletal remains of diatoms—microscopic, one-celled, aquatic plants. The crude earth consists of porous, irregular particles of nearly pure amorphous silica, and it is processed into many grades for a variety of purposes.

Advantages

1. Diatomaceous earth powder as an investment material has the advantage of permitting one- and two-surface gold castings to be made while the patient waits in the chair. Approximately five minutes are required between taking the wax pattern and removal of the casting from the investment.

2. Casting in a dry powder eliminates the possibility of bubbles.

3. The technique is simple. It requires, in addition to the centrifugal casting machine and its fitting ring, only a small casting ring, one-half or five-eighths inch in diameter and three-fourths inch long.

Procedure

1. After making the usual wax pattern, sprue it at the point where there is the least chance of distortion in packing. On single surface castings there is virtually no chance of distortion; these should be used to learn the technique.

2. Loosely fill a small casting ring with dry diatomaceous earth powder; embed the inlay pattern near the center (Fig. 1), and pack powder around the pattern with the fingers through both ends of the ring at the same time.

Fig. 1—Placing inlay pattern in center of loose diatomite in ring.

3. When the powder is quite firmly packed, place the ring on a sprue former (Fig. 2). Fit the sprue loosely into the hole of the sprue former.

Fig. 2—Holding ring containing inlay pattern and tightly packed diatomite ready for sprue former.

*The material used here is a special grade processed and furnished by Johns-Manville Corporation, operators of the world's largest deposit at Lompoc, California.

Fig. 3 (top)—Forming sprue cavity.
Fig. 4 (center)—Mold ready for casting.
Fig. 5 (bottom)—Milled diatomite 320x.

4. With the thumb on the opposite end of the ring and the finger on the base of the sprue former, press with considerable force (Fig. 3).

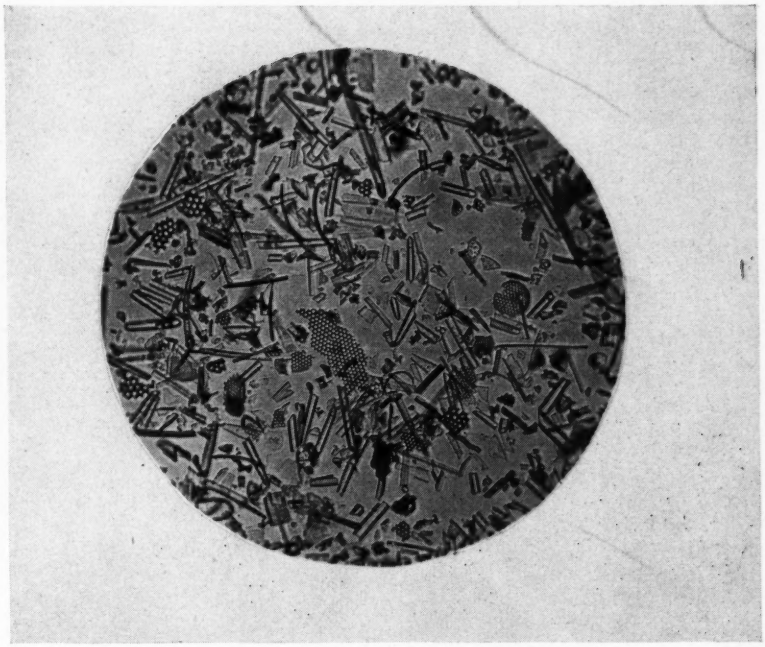
5. Remove the sprue former; test the sprue to determine the degree of firmness. If firm enough, heat the sprue and carefully remove it. If there is play, put more powder on both ends of the ring and re-press.

6. After removing the sprue, grasp the ring in heavy soldering pliers and hold, sprue down, over a bunsen flame until the wax burns off (Fig. 4).

7. Place the ring in a larger ring, previously prepared. Put the two rings in the proper place on a casting machine and cast in the usual manner.

The packed powder in the casting ring holds together without distortion during the burning out of the wax and the casting of the gold because of the irregular surface and shape of the particles of diatomaceous earth. To recover the inlay from its investment, simply wash under the faucet or in a pan of cold water. The investment will not stick to the casting.

It is necessary to use a small casting ring to allow sufficient heat to reach the wax through the highly insulating powder. Bronze bushings of the correct size, obtainable at any garage, are suitable. The regular casting ring may be made into a permanent socket for the small ring by filling it with soft plaster and embedding the small ring, previously sealed on one end with wax and coated with wax.



Restoration of Lost Vertical Dimension, Resulting in Improved Hearing and Relief of a Disorder of the Temporomandibular Articulation: (A Case Report)

S. L. QUITT, D.D.S., Greenwich, Connecticut

Construction of an acrylic splint to raise the bite supplemented dental restorations in the treatment of this returned serviceman who experienced a number of discomforts and disabilities as a result of lost vertical dimension.

Case History

THE PATIENT, a young man aged 23, recently returned from the China-Burma-India Theatre of War. He presented himself for a dental examination, complaining of pain in his temporomandibular joints, continuous grinding of his teeth at night, and definite impairment of hearing. He had gradually become aware of the closing of his bite and of increasing difficulty in masticating his food and was extremely self-conscious about the protrusion of his lower lip (Figs. 1, 2, 3, 4, and 5).

Examination—Clinical examination disclosed the following:

1. Previous loss of the lower central incisors, lower right first molar, upper right first bicuspid, and upper left cuspid and first molar.

2. Fractures at the angles of the upper central incisors. Upper left lateral knocked out of alinement and actually hanging by a thread.

3. Incomplete eruption of the mandibular molars which indicated failure in vertical growth.

4. Normal appearance of the mucous membrane and the surrounding tissues.

Roentgenographic examination disclosed no pathologic condition.

Diagnosis—I referred the patient to an otolaryngologist for examination of his ears, maxillary sinus, and

Fig. 1—Front view of patient before treatment. (Note protrusion of lower lip due to closing of bite.)

Fig. 2—Profile view before treatment.

Fig. 3—View demonstrating closed bite. (Note fractured upper central incisors and missing lower central incisors.)

Fig. 4—Occlusal view of study models.

accessory sinuses. The physician informed me that there was no existing disease, that impaired hearing was probably due to a beginning obliteration of the auditory canal as a result of the loss of vertical dimension

Fig. 5—Study models in centric occlusion; same view as Figure 3.

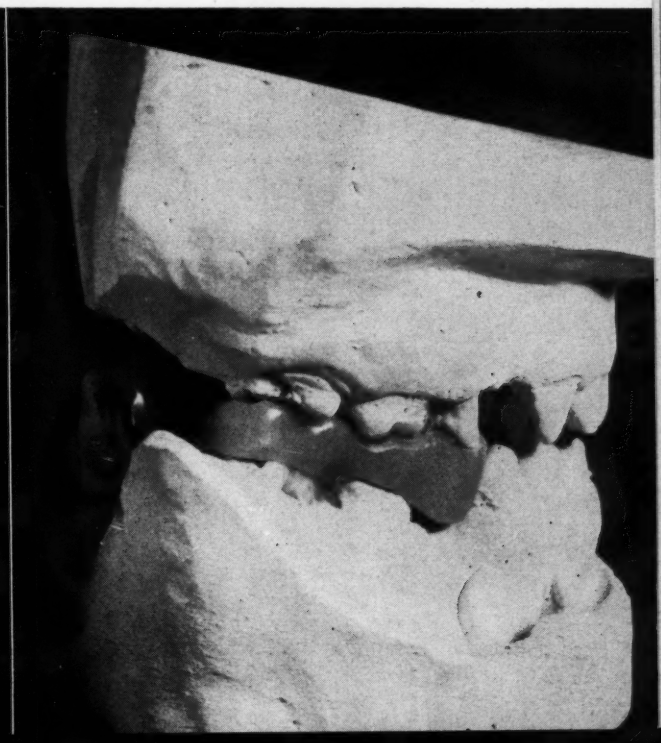


Fig. 6—Lateral view of casts with acrylic splint in position. (Note extent of raising of bite in posterior area.)

Fig. 7—Amalgam dies in upper model for building of porcelain jacket crowns for central incisors and lateral incisor.

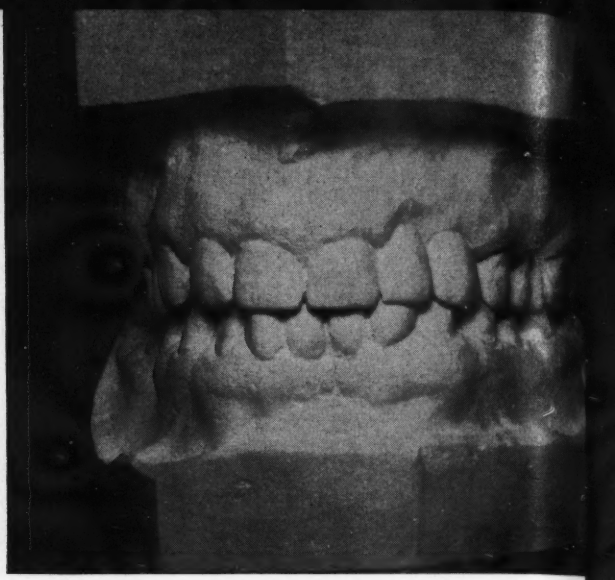


Fig. 8—Completed case showing models in centric relation. (Note correction of vertical dimension.)

in the patient's jaw relationship.

Method of Treatment

Construction of Acrylic Splint—Impressions were taken with alginate material for the purpose of constructing an acrylic splint to raise the bite. Models were articulated and the bite was raised to the extent of four and one-half millimeters. Bite blocks were tried in the mouth, and the patient immediately felt a sense of relief and noticeable relaxation of the facial muscles. An acrylic splint was constructed and the patient instructed to wear it nightly for a period of two weeks (Fig. 6). The patient reported physical improvement and lessening of pain in the mandibular joints after wearing the splint.

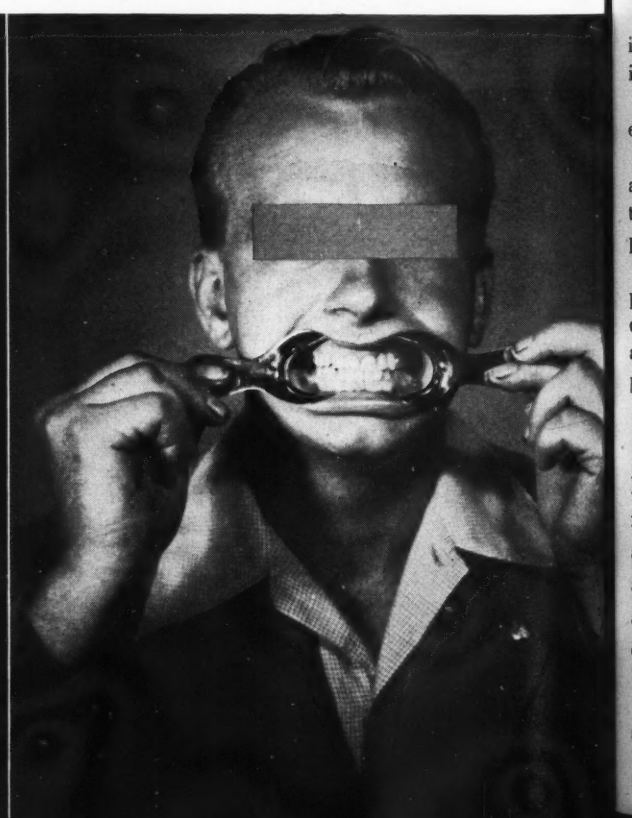
Restorations—1. Both maxillary second molars were prepared for the reception of gold cast crowns and both second lower molars were prepared to receive three-quarter cast inlays. The height of the occlusion was determined by cutting the acrylic splint in half and having the patient bite on the opposite side during the carving of inlays.

2. The upper right second bicuspid was prepared for a three-quarter cast crown to be used as an abutment to replace the lost first bicuspid.

3. The lower right second molar and lower right second bicuspid were

Fig. 9—Lateral view of casts in Figure 8.

Fig. 10—Appearance of patient on completion of restorations.



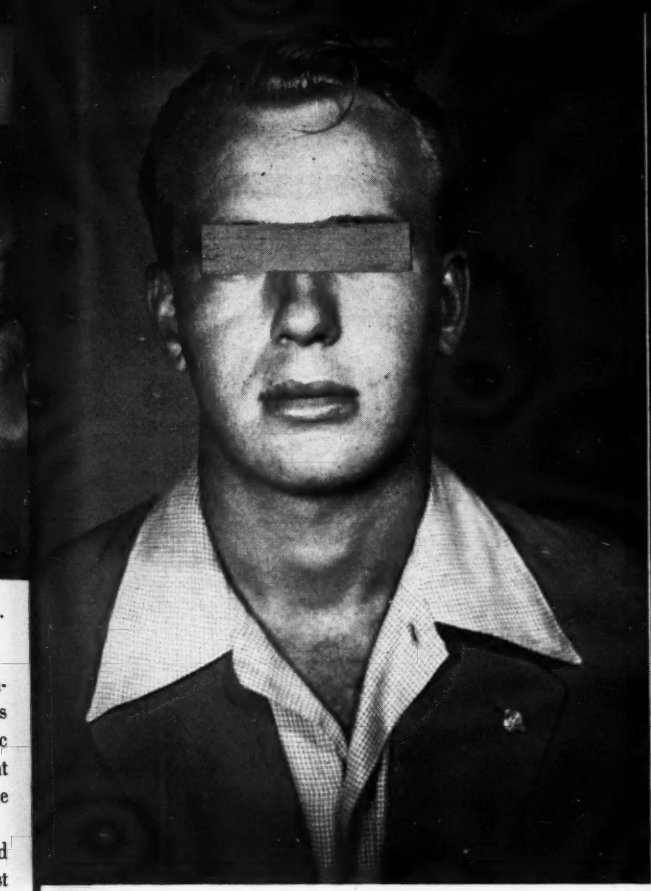


Fig. 11—Front view of patient after work was completed. (Note improved appearance and normal lip relationship.)

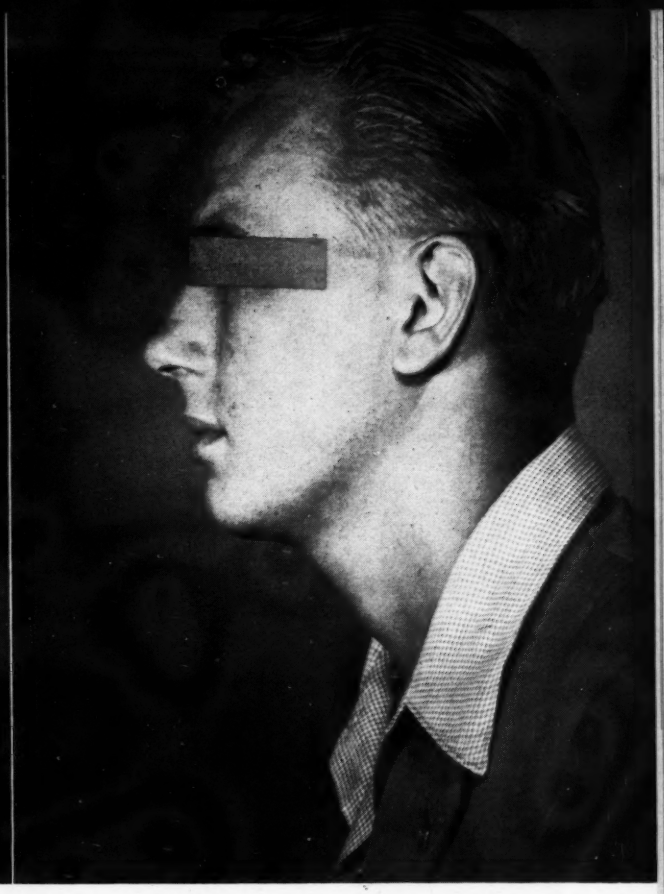


Fig. 12—Profile view of patient. (Note restoration of vertical dimension and normal relation of lips.)

prepared for reception of three-quarter cast crowns to serve as abutments for the bridge to replace the lost first molar.

4. The height of occlusion for carving inlays was determined by inserting a splint on the opposite side.

5. The upper left lateral incisor was extracted.

6. The upper right lateral incisor and upper two centrals were prepared to receive shoulder jacket crowns on platinum copings (Fig. 7).

7. The upper left first bicuspid was prepared for reception of a three-quarter cast crown to be used as an abutment with the coping of the upper left central incisor. A cast saddle was constructed, uniting the coping of the left central incisor and the upper left three-quarter casting on the first bicuspid. Individual jacket crowns were baked to replace the lost upper left lateral and cuspid.

8. The upper left first molar lost previously was replaced by a bridge, the cast gold crown for the upper left second molar and the M.O.D. inlay on the upper left second bicuspid being used as abutments.

9. The lower two laterals were prepared to receive gold copings which were to serve as abutments for the construction of an acrylic bridge to supply lower central incisors.

Results

All the fixed restorations and upper jacket crowns were cemented in position in one sitting and the patient was dismissed with instructions to report within a week for the checking of occlusion and for necessary adjustments (Figs. 8, 9, and 10). From that time until his last visit two months ago, the patient felt quite comfortable and showed remarkable improvement in appearance. The pain in the mandibular joints had disappeared completely and his hearing was virtually normal (Figs. 10, 11, and 12).

73 *Greenwich Avenue*

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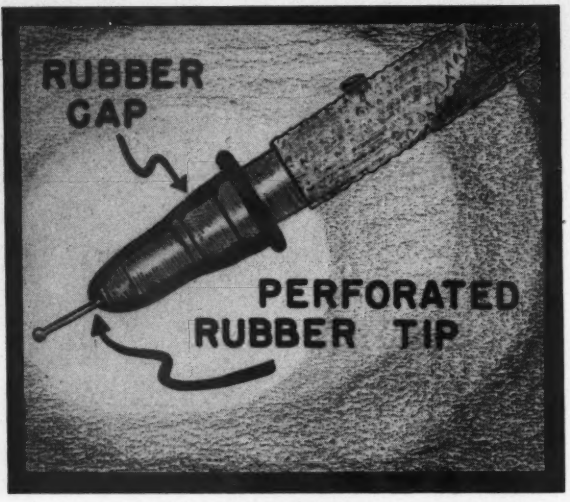

Fig. 1

Handpiece Protector

Antonio Miguel Garcia, D.D.S., Esmeralda, Prov. Camaguey, Cuba

Fig. 1—A rubber cap such as one used in a cement liquid dropper is perforated in the center. The cap is placed over the end of the handpiece. The bur, mandrel, or mounted stone is inserted in position through the perforation. This cap protects the inside of the handpiece from grit and debris.

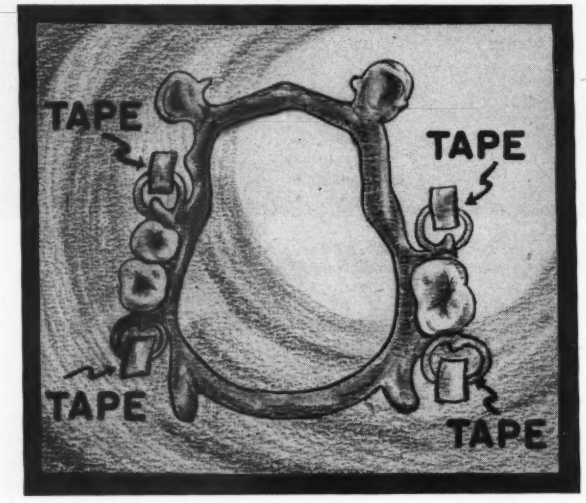

Fig. 2

Protecting Castings During Polishing

Joseph R. Valinoti, Jr., D.D.S., Brooklyn, New York

Fig. 2—In polishing partial denture castings, the fibers of the rag polishing wheel frequently catch clasps and other sharp projections. This action forcibly whips the casting out of the hands and thus causes distortion and other damage. The inconvenience may be overcome by placing a strip of adhesive tape over the clasps while the major part of the casting is being polished. The tape is later removed and the casting polished separately with rubber wheels and brushes in a handpiece.

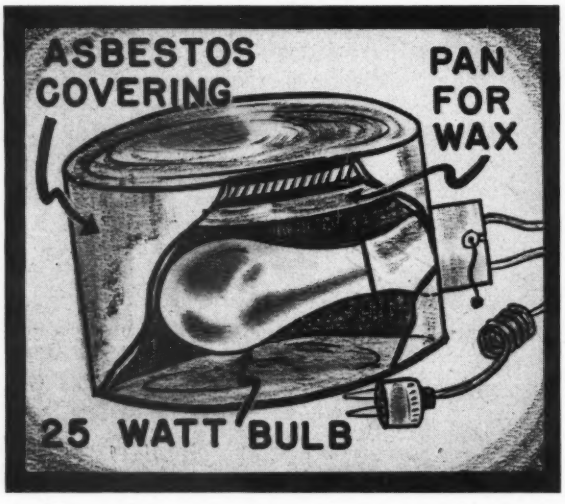

Fig. 3

A Convenient Wax Heater

G. I. McBride, D.D.S., Enid, Oklahoma

Fig. 3—Utilizing a tin can that has a depressed cover (the one illustrated contained General Electric x-ray developing powder), drill a hole in the side of the can and insert a light socket. Attach a 25-watt bulb and pack asbestos inside the can to conserve radiation. Place wax in the depressed can cover. When the light is turned on, the wax melts and remains in a molten state as long as the current is on.

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You do not have to write an article. Furnish us with rough drawings or sketches, from which we will make suitable illustrations; write a brief description of the

...GGESTIONS . . . .

A Protector For Teeth During Extraction

C. C. Reid, D.D.S., Crossett, Arkansas

Fig. 4—During extractions, notably in the lower jaw, the forceps occasionally slip and strike the upper teeth. To protect the teeth from such an injury, slip a piece of soft rubber tubing over the forceps at the joint.

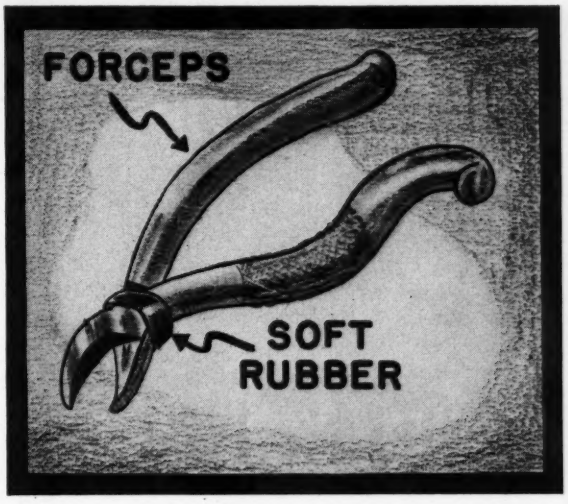


Fig. 4

Sharpening Diamond Stones and Points

Robert V. Bryan, D.D.S., Berkeley, California

Fig. 5—The diamond stone or point that has been worn smooth is dipped into commercial nitric acid for a few minutes until the base metal binder dissolves sufficiently to expose new diamond particles. *Warning*: Do not allow the metal shank of the stone to come in contact with the nitric acid.

Fig. 5

A Clip To Hold A Celluloid Matrix

M. Vergales, Ph.M. 3/c, Little Creek, Virginia

Fig. 6—The clip is made from an ordinary safety pin. The head of the pin is cut off and the pin is bent according to the diagram. After inserting silicate in an anterior tooth, the matrix is drawn tightly against the adjacent tooth. The clip is then placed in the interproximal space between the tooth being restored and the adjacent tooth.

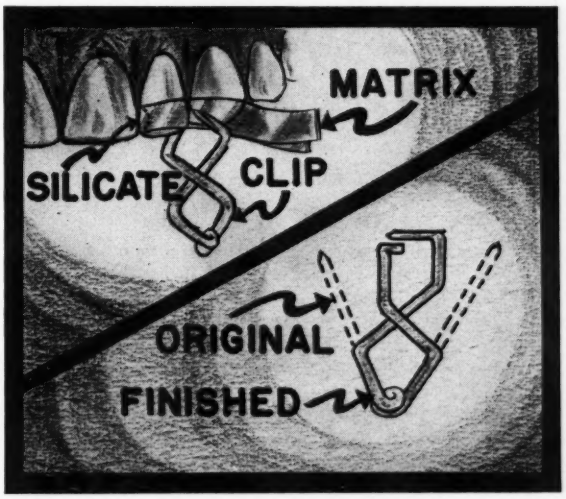
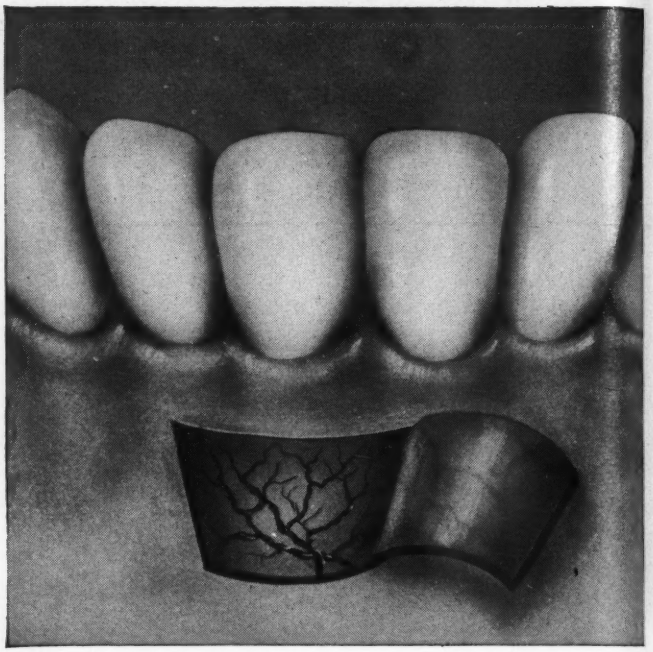


Fig. 6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time.

Send your ideas to: Clinical and Laboratory Suggestions Editor, THE DENTAL DIGEST, 708 Church Street, Evanston, Illinois.



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*Pharmacology and Dental Therapeutics, a Textbook for Students and Practitioners, ed. 1, St. Louis, the C. V. Mosby Co., 1945, p. 450.

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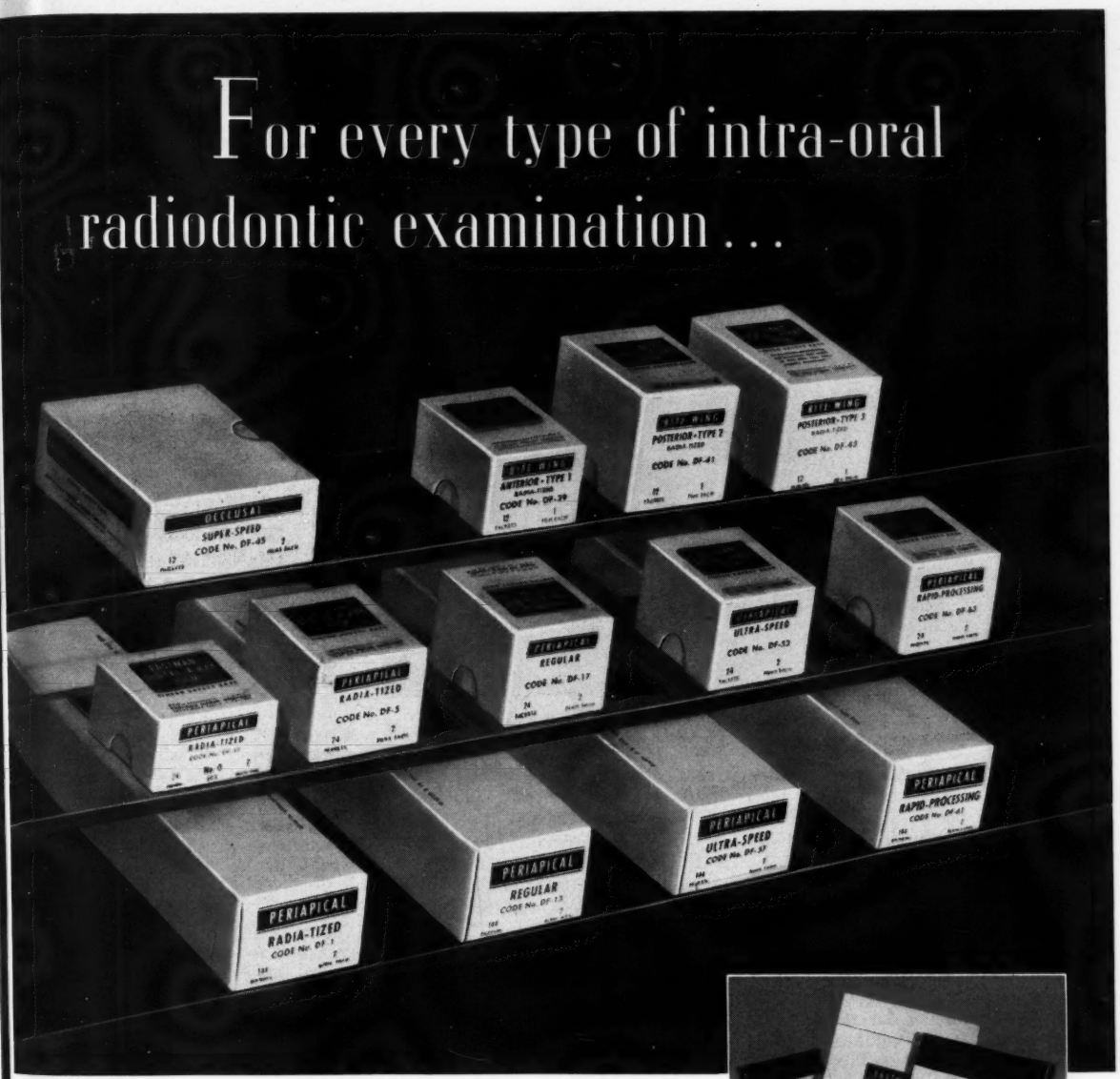

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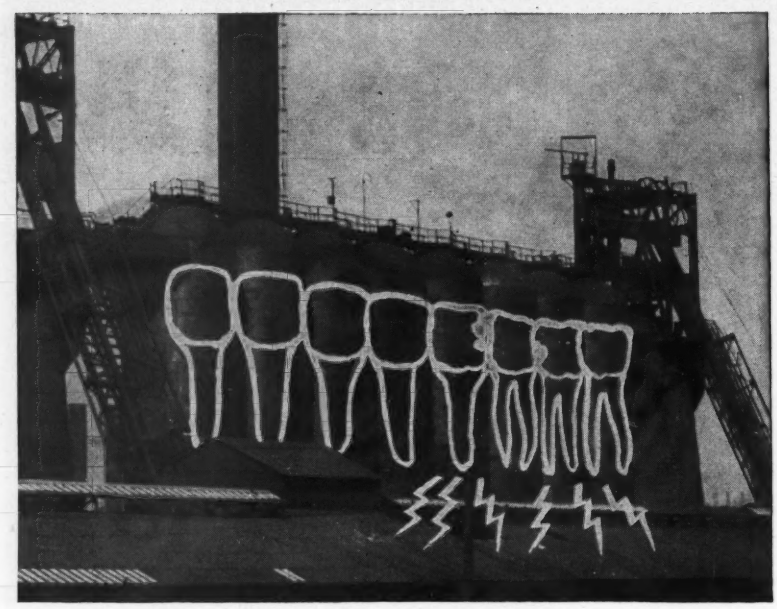

Industry's Toothache

"Industry's toothaches are varied and endless and fraught with dangerous consequences," says Doctor Ernest Goldhorn, industrial dentist of Pullman-Standard Car Manufacturing Company . . . "By proper dental supervision and the collaboration of the dentist, physician, hygienist, and safety engineer, virtually all occupational disease processes having oral manifestations may be controlled if not eliminated." The American Dental Association and a number of component societies are working to extend dental health care and education to as many groups of industrial workers as possible.

★ ★ ★

"Are Dental Fees Too High?" , , , Don't answer until you have read Doctor Douglas W. Stephens article in the September issue of Oral Hygiene. There's a lot of sound psychology in his suggestion that dentists explain more carefully *what the patient is getting* in exchange for the money he is paying.

★ ★ ★

Change his life by changing his denture? . . . Probably not, but you certainly do have the power to improve or to mar his appearance when you design your patient's denture. Doctor James E. Callaway explains why more art is needed in the science of dentistry . . . You will enjoy his article, "Break That Parenthesis."

Do you get "satisfactory" or "poor" work from your laboratory? Do you have to spend time on adjustments and remakes? . . . You, and not the laboratory, may be to blame. Doctor Albert G. Pietsch explains why in his interesting article, "Make the Most of Your Time."

★ ★ ★

Are you on a committee? . . . Whether it's your dental society or the town council, you will want to clip the article, "It Was a Good Dental Meeting—or Was It?" and paste it in your notebook. Sherman Holling, D.D.S. gives more good ideas in three pages than many an author crams into a full-sized book. Every "Mr. Chairman" should read it—and heed it.

★ ★ ★

Do your patients dread an anesthetic? . . . Perhaps your assistant can be of more help than you realize in quelling the natural fear of "blacking out." Have her read the article, "Role of the Dental Assistant in Anesthesia Preparation," and try out the suggestions on your next apprehensive patient. We think you'll be pleased.

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Contra-Angles

Hero of the Night . . .

Anybody who risks talking about his dreams is encouraging the amateur psychoanalysts to lay bare his dark inner self. Psychoanalysts make a big point of what you experience and who you know in your dreams. Everything, to them, has a sex symbolism or is a carry-over of frustration or of satisfaction from infantile days.

Anybody who has ever tried to make head or tail of dream stuff must admit that dream patterns make little sense. Even with the far-fetched interpretations of the analysts, dreams are still jumbled up, screwy experiences. Dreaming about a great aunt, dead for sixty years, riding a pogo stick down Main Street may have phallic symbolism with a dash of incest. Dreaming about subduing armed brigands with one's own strong bare hands may mean a deep-seated insecurity that finds expression in the sleep hours.

Very likely the fears and frustrations that we hide in our psyche, unknown to ourselves and to the world, do creep out when our conscious defenses are lowered in sleep. That makes sense. But when any mortal man, be he psychoanalyst or soothsayer, talks as though he *knew* the complicated workings of the deep inner self, it is time to call his shot. For how in the world can anyone know how the mind operates? Sure, we can talk about receptors and neuropathways and higher cerebral centers; but no one has ever actually seen this kind of chain reaction at work.

There are dashes of other ingredients that go into a reaction pattern. We may call them emotional, connotative, or cultural. The feeling tone that we carry to so-called objective experience colors our interpretation of that experience. If we like what our

sensory receptors experience, our interpretation of the event is quite different from what it is if our feeling tone is one of dislike. For example, the fellow who likes limburger cheese will become ecstatic over the experience of tasting the stuff. The fellow who doesn't like the sight or the smell of the cheese builds up an emotional dislike for the stuff before it has a chance to stimulate his taste buds. He is certainly not a limburger cheese enthusiast.

Into our every experience are thrust these emotional associations. They make life complicated and, if we're willing to be trite, let's say—interesting. The fact is that so-called mental processes have so many facets that they cannot be foretold with any accuracy. Simple sensory-motor reactions, like drawing a hand away from a fire, are common to all living things. At the higher mental levels, however, the chain of reaction is unpredictable. So, if we have this much difficulty understanding and explaining *conscious* processes and behavior, how much more difficult must it be to explain the weird experiences we have during sleep—the *suspended* state of consciousness.

If dreams have a pattern—and they do likely have—their unravelling probably always will be too complicated for Man. There is no harm in theorizing what form they take, however, provided we realize we are playing with a theory, not with an established fact (whatever a fact may be). One pattern of the many that is interesting to me is the heroic roles that we often play in our dreams. Everybody that I have ever talked to about this admits that at some time he has been the dream embodiment of David knocking off Goliath or Jack whacking off the bean stalk to kill the giant. Even serious biblical writers and the inventors of fairy stories have their moments of aggression!

This role that we often assume in dreams, this hero of the night who knows no fears, may be a safety device that wise nature has provided to protect our ego and keep us from harming ourselves and others during waking hours. If dream experiences are strong enough to convince us that we are brave and strong heroes of heart and body, there may be no need to strut our ego for protection during the day. Casper Milquetoast may be meek and mild in the workaday world because he has brave dreams of heroic proportions to protect his ego. Daredevil Barnell, on the other hand, may be so weak in dreams that he can only protect his ego by daring acts during working hours.

Does writing about this theory of dreams serve any good purpose? Probably not, except to emphasize that this thing called ego strives for protection and approval at all costs. Everybody has it. The wise man not only protects his own ego but the ego of the other fellow. The person most skillful in getting along with other people recognizes that the other fellow has rights, interests, property, ideas that all bundle up to make his ego. Most of us are so busy protecting our own ego that we are likely to encroach on the one belonging to the other fellow; and then there is trouble —sometimes a war, a private fight, or

a feeling of dislike and hostility. In any case, the result is not good. The ego defends and inflates itself at all costs and at all times, during the waking hours and during dreams. Whatever we do to help the other fellow develop *his* ego will help us to develop and expand our own. *It is true that by giving we receive.*

Not For Now, But For Eternity

This sounds like a slogan for one of the new ball-point fountain pens. Every one that comes on the market carries a longer "guarantee." In six months I have had four of the damn things. The first two burned out their bearings, or whatever happens to pens before they have any accumulated writage; the third of this make dribbled out in the middle of a sentence after a couple of weeks' use; the fourth and current one chose to collapse at a time when I was at my farm five miles from a bottle of ink.

If the manufacturers put more workmanship into their products and less sensationalism and fewer extrava-

gant promises in their advertising, stranded writers would sing their praises. When you distil the drops of truth from the advertising deluge, you become aware that the "guarantee" means precisely nothing. If one bought one of these pens and locked it up in a safety deposit box, it probably would last for a hundred years or longer without refilling. Under use, however, any mechanical thing will run dry and begin to falter. That goes for automobiles or any other mechanism. (FLASH! The dry pen that was guaranteed to last forever and forever has been returned to the seller after three months' use for an ink transfusion. But stores have none of the ink cartridges in stock. It appears that the manufacturers were so awed with their own extravagant promises that they forgot to make up any refills just in case a pen did run dry before Gabriel got busy on his horn.)

Here I am, stranded with a fancy pen that can't write but the "hucksters" go on crying their wares over the radio and on the printed page—promising a pen that will last for eternity. But they don't say it will *write!*

Dentists often fall into the same extravagances as the pen peddlers. They talk about "permanent" and "fixed." Nothing is permanent in tissue and nothing is fixed that must function. It is begging the point to explain that the denture never varies but the supporting tissue does. A "permanent" denture that is no longer in intimate relation with the tissue is as useless as the empty fountain pen and as annoying to the owner. Very likely the dentist who used the expression "permanent denture" had no intention to defraud the patient. He is, however, guilty of a poor choice of words.

In a verbal society such as our own, it is extremely important to select words with care if we do not want communication failures. I would feel more kindly toward the makers of the new ball type pens if they estimated how many words could be written rather than implying that countless years might pass before a refilling was required. We are not going to return to the goose quill but do want to

DENTIST'S DREAMS . . . CAN COME TRUE

When you buy a dental x-ray unit . . . . you make a major decision about a major asset to your dental practice. And to be sure that your x-ray unit will be a *lasting* asset you naturally choose a unit for its appearance, its ease of operation, and its reputation for long-lasting satisfactory service.

The G-E Model *CDX* is just such a unit. Its compact size and neat appearance make it ideal for every type office or clinic. Its ease of operation is a joy for those just beginning their own practice as well as for experienced dentists. Best of all, it produces easy-to-diagnose radiographs for years and years without the constant attention of a service man.

Give yourself the lasting satisfaction of this dental x-ray unit . . . . select your *CDX* now . . . you'll find in it that plus-quality difference you have a right to expect in all General Electric equipment. *For complete information on the* CDX, *write General Electric X-Ray Corporation, 175 W. Jackson Blvd., Chicago 4, Illinois, Dept. 2580, or see your dental dealer.*

GENERAL ELECTRIC
X-RAY CORPORATION

point out that everytime a product is marketed under a cloud of misrepresentation or extravagant claims, buyer resistance for *all* products is raised.

Dental patients are often disturbed and unhappy when we tell them of the limitations of dental treatment and procedures. In the long pull, though, the dentist who tells his patients the facts wins respect and confidence; that is good business for anybody.—E.J.R.

Tic and Spasm

ALFRED GORDON, M.D., Philadelphia

A CLEAR distinction must be made between tic and facial spasm as they differ fundamentally in their nature, origin, symptomatology and therefore treatment. Convulsive movements of the face appear in three principal forms: spasm, tic, and epileptic twitchings. The last mentioned are usually associated with generalized or with focal epilepsy.

Tic

This type of movement is characterized by a sudden and abrupt contraction of one or several muscles. As these contractions are invariably the same, they are coordinate and always executed for a certain functional purpose.

Origin—The movements of tic were originally made for a certain good reason and under the influence of the will. For example, a foreign body accidentally got under a person's eyelid; irritation was produced; he closed and opened his eyelids; he endeavored to get rid of it. Finally the body was removed. Normally this would have been the end of the trouble. But the person continued the reproduction of the sensation of the foreign body; he repeated the act of closing and opening the eye. Gradually he forgot the original trouble. The act became a habit and the movement became automatic. While at the beginning the movements were logical and reasonable, they became superfluous.

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Mental Nature Of—Tic is a mental phenomenon. It is the abnormal reaction of a mentally unstable individual. That *a psychic element is predominant in tic* can be seen from the singular satisfaction the person experiences from indulging in the tic movements. He may make an effort to inhibit the tic but the effort of his will is meager and short in duration.

A characteristic diagnostic element of tic is that the muscular contractions do not correspond to a well defined anatomic distribution of a certain nerve supply.

Facial Spasm

This type of movement does not present a reproduction of a purposeful physiologic act. It consists in a motor reaction following an irritation of any part along the spinal reflex act. It is strictly confined to the area of distribution of the facial nerve.

Symptoms—The muscular contractions in spasm are either slow and coarse or rapid and fascicular. The muscles supplied by the upper facial nerve alone may be involved in which case a contraction of the frontalis and orbicularis palpebrarum muscles is observable. The lower facial nerve may be irritated and the muscles of the lower part of the face contract as well as the muscles of the neck on the same side.

Nature Of—The twitching is illogical and without any reasonable expression; it does not resemble the ordinary mimicry of the face. The will has no cerebral inhibitory power to arrest the attack which is not true in the case of tic. Spasm may occur in sleep, while tic does not.

Irritation of any portion of the seventh nerve or of its nucleus or else of the sensory fibers of the fifth nerve will produce a spasm through the reflex arc. Irritation of the palpebral mucosa will produce a spasm of the orbicularis.

Treatment

In view of the different pathogenesis of the two disorders, the treatment must logically differ.

Psychotherapeutic—In tic the

treatment must be directed chiefly toward the patient's psyche. Psychotherapy, with regularly practiced training to immobilize the face, will eventually bring results.

Ethyl Alcohol Injections—The management of facial spasm must be totally different. Among all the methods used by competent men, injection of ethyl alcohol is the most satisfactory. The method consists in injecting with an ordinary hypodermic syringe into the facial nerve in the stylomastoid foramen 5 minims (0.3 cc.) of 80 per cent solution of alcohol. The injection can be done without a preliminary localized anesthetic.

—From Correspondence, *Journal of the American Medical Association* 131:177 (May 11) 1946.

DENTAL MEETING Dates

University of Buffalo School of Dentistry, forty-fourth annual meeting, Hotel Statler, Buffalo, October 8-10.

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Montreal Dental Club, twenty-second annual meeting, October 23-25, Mount Royal York Hotel, Montreal.

American Society for the Advancement of General Anesthesia in Dentistry, Hotel New Yorker, October 28. For information write to Doctor M. Hillel Feldman, 730 Fifth Ave., New York City.

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Florida State Board of Dental Examiners, regular meeting, Seminole Hotel, Jacksonville, October 28-31. For information write to Doctor A. W. Kellner, P. O. Box 155, Hollywood.

The St. Louis University Dental Alumni Association, postwar reunion, School of Dentistry Building, St. Louis, November 22-23. For information write to Doctor O. J. Dick, 1657 S. Grand St., St. Louis 4.

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Journees Dentaires De Paris, regular meeting, Ecole Odontotechnique of Paris, France, November 21-24.

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Pennsylvania State Dental Society, annual meeting, Hotel Bellevue-Stratford, Philadelphia, May 6-8, 1947.

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Tennessee State Dental Association, eightieth annual meeting, Hotel Andrew Jackson, Nashville, May 12-15, 1947.

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New Jersey State Board of Dental Examiners, regular meeting, December 9-14. For information write to Doctor W. A. Wilson, 150 East State Street, Trenton.

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